GROSS DOMESTIC PRODUCT FROM OHIO

JANUARY 2020

Don Larrick, Principal Analyst
Office of Research, Ohio Development Services Agency
P.O. Box 1001, Columbus, Oh. 43216-1001
Steven Kelley, Editor

TABLE OF CONTENTS

INTRODUCTION

INTRODUCTION

This report provides an overview of Ohio's economy and its role in the U.S. economy. It looks at the production of goods and the provision of services by people using capital located here; i.e., the Gross Domestic Product (GDP) from Ohio.

There are four major sections after this introduction and highlights. The first describes the composition of Ohio's economy, comparing it with other states and the national distribution of economic activity. The second notes the distribution of economic activity in Ohio by county and selected metropolitan areas. The third focuses on output by sector and the major industries therein, noting the key groups or specific industries within the major industries and their relative concentrations in Ohio as well as recent trends here and across the nation. The last is an appendix containing a section on terminology and data tables for those seeking a more-detailed understanding of recent economic activity here. The graphs and most of the discussions herein are based on, and refer to, the appendix tables.

The report describes economic activity from 1997 through 2018 but concentrates on 2007-2017 for the more detailed analyses of sectors and the major industries therein. Data were collected and prepared by the U.S. Bureau of Economic Analysis (BEA). The detailed GDP estimates are based on state and local taxes, value-added reports and company financial data. The BEA also has released initial total and sector-summary estimates for 2018. Figures for more recent years may have been revised from previous reports based on new and revised data from at least 19 federal agencies. See Platt and Mead (2017) for more details. The U.S. Bureau of the Census, other federal agencies, and several private sector organizations developed additional statistics cited in this report.

Total and sector figures for metropolitan areas and counties recently were released and have been incorporated into this expanded edition. While revised state-level figures also were released with the metropolitan and county statistics, the new state-level statistics have, with few exceptions, not been used due to time constraints. However, County Business Patterns data have been updated to 2017.

HIGHLIGHTS

- Ohio's 2018 Gross Domestic Product is initially estimated at $676.2 billion, up 4.7 percent from the revised 2017 estimate of $645.8 billion and its ninth consecutive year of growth.

- Growth has continued through the third quarter of 2019, most recently at a seasonally adjusted annual rate of 1.7 percent after adjusting for inflation.

- Ohio is the 7th largest source for the U.S. Gross Domestic Product with 3.3 percent of the national total in 2018.

- If Ohio was a separate country, it would be the 36th largest national economy in the world.

- Manufacturing is the largest of the 20 sectors in Ohio's economy with 16.6 percent of its total output in 2018; durable goods were the larger part of manufacturing with 9.4 percent while non-durable goods were 7.2 percent.

- Ohio's manufacturing sector produced $112.2 billion worth of goods – 4.8 percent of America's manufacturing output in 2018, ranking it 3rd after California and Texas.

- Ohio is a leading source for many manufactured goods: primary and fabricated metal products as well as non-metallic mineral products, plastic and rubber goods, machinery, electrical equipment and appliances, and transportation equipment – especially motor vehicles and associated parts.

- Ohio recently emerged as a leading source for oil and natural gas, and now 4th-ranked with 4.8 percent of national output; it also is a prominent provider of related petroleum and coal products and pipeline services.

- Major service industries concentrated here include banking and related services, insurance, trucking, warehousing and storage, hospitals, nursing and residential care facilities, waste management and remediation, and enterprise management (55 Fortune U.S.-1,000 companies have their headquarters here, with seven of those on Fortune's Global-500 list).

- The Cleveland-Elyria and Columbus metropolitan areas, combined with the Ohio portion of the Cincinnati area, produced 56.3 percent of Ohio's GDP in 2018; Cuyahoga, Franklin, Hamilton, Summit, Montgomery and Lucas Counties combined to produce 53.3 percent.

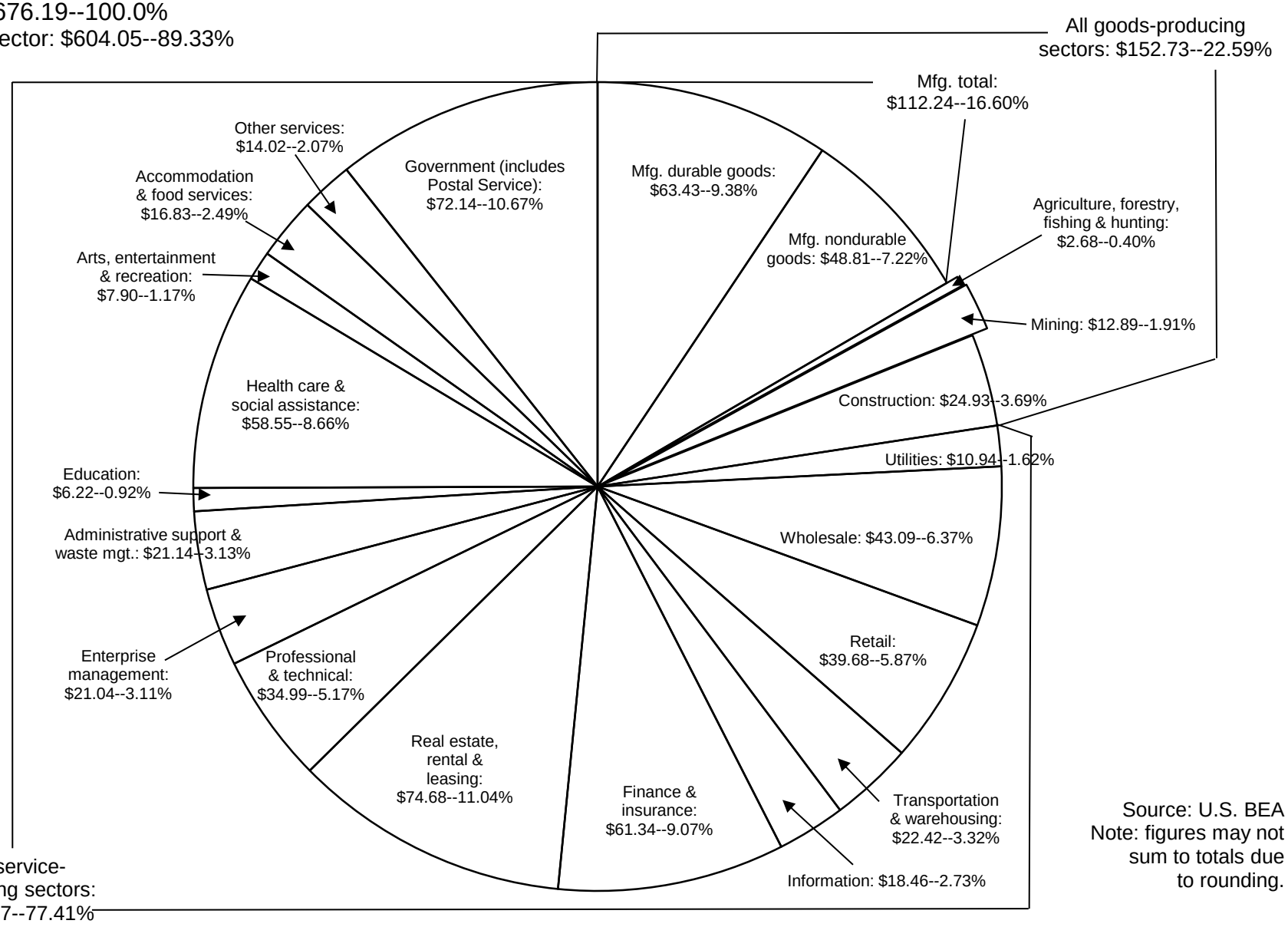
This page intentionally blank

DESCRIPTION OF OHIO'S ECONOMY

Ohio's Gross Domestic Product by Sector: Initial Figures for 2018

(in billions, except percentages)

Total: $676.19--100.0%
Private sector: $604.05--89.33%



Source: U.S. BEA
Note: figures may not sum to totals due to rounding.

OHIO'S ECONOMY IN 2018

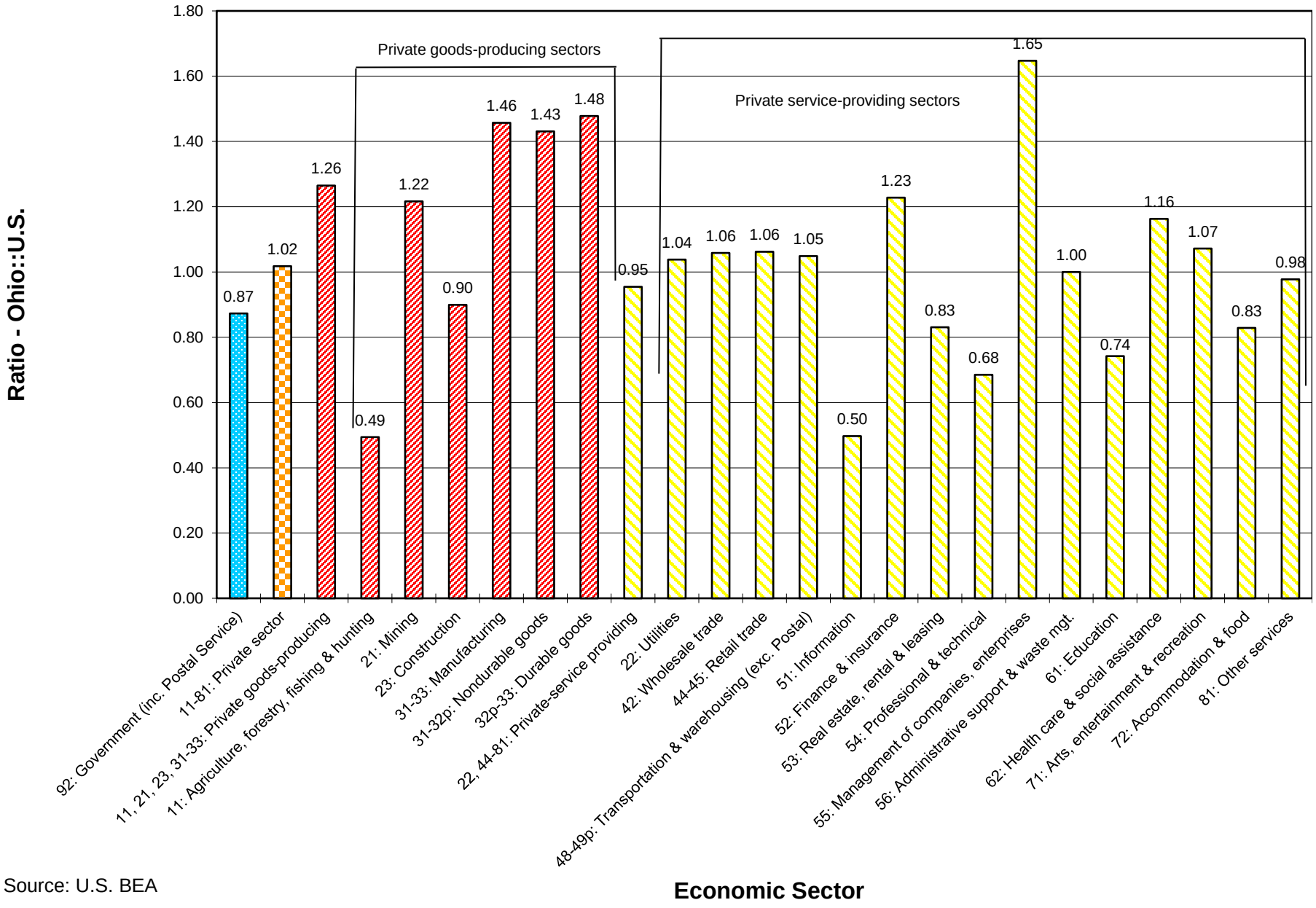
The chart above illustrates the distribution of economic activity in Ohio using the North American Industry Classification System (NAICS). Ohio's total economic output of $676.19 billion in 2018 is divided into 20 broad sectors of varying sizes. (Durable and non-durable goods manufacturing are two parts of one sector).

Manufacturing is the largest single sector, with such establishments producing final goods valued at $112.24 billion, which was 16.60 percent of the state's total economic output. Manufacturers are divided into producers of durable and non-durable goods, with the former producing more than the latter: $63.43 billion and 9.38 percent, compared with $48.81 billion and 7.22 percent. (Durable goods generally are made to last at least three years, while non-durables usually are expected to last less than three years.) Other goods-producing sectors play smaller roles in Ohio's economy. They include construction at $24.93 billion and 3.69 percent, mining at $12.89 billion and 1.91 percent, and agriculture-forestry-fishing-hunting at $2.68 billion and 0.40 percent. Combined output of these goods-producing sectors totaled $152.73 billion, or 22.59 percent of the total GDP from Ohio.

Services provided by public and private sectors in Ohio were $523.47 billion, or 77.41 percent of its economy. Total private sector services (i.e., excluding government services) were $451.33 billion, or 66.75 percent of the total. Real estate, rental and leasing is the largest private sector service with a value of $74.68 billion, or 11.04 percent of the economy. Its size primarily indicates the role homeownership plays in the economy, not just the activity of real estate agents, landlords, lessors, etc. Finance-and-insurance is the next largest sector, contributing $61.34 billion and 9.07 percent to the economy, followed by health care and social assistance at $58.55 billion and 8.66 percent. Other private service sectors providing at least five percent of Ohio's economic output were wholesale and retail trade at 6.37 and 5.87 percent, and professional-scientific-technical services at 5.17 percent. Other sectors played smaller roles. These include transportation and warehousing, information, enterprise management, administrative-support/waste-management, education, arts-entertainment-recreation, accommodation and food services, and the catch-all category of other services. Services provided by federal, state and local governments amounted to 10.67 percent of the economy.

See Table A1

The Relative Concentration of U.S. Economic Activity in Ohio, 2018



Source: U.S. BEA

COMPARING THE DISTRIBUTION OF ECONOMIC ACTIVITY IN OHIO WITH THAT OF THE U.S.

The preceding section showed the distribution of economic activity in Ohio across 20 sectors of the economy. For example, manufacturing was the largest sector in Ohio at 16.60 percent of GDP in 2018, while agriculture-forestry-fishing-hunting (AFFH) was the smallest at 0.40 percent. This section furthers our understanding of Ohio's economy by comparing the distribution of output across sectors in Ohio with the corresponding national distribution. The graph above shows the *ratios* of these percentages for each sector. Continuing with the two examples, output from manufacturing and AFFH comprised 11.39 and 0.80 percent, respectively, of U.S. GDP in 2018. When compared with those for Ohio, these yield ratios of 1.46 for manufacturing (16.60 percent divided by 11.39 percent) and .49 for AFFH (0.40 percent divided by 0.80 percent – all figures are rounded). There are two ways to express the meanings of these figures. One way is to say that Ohio's economy is *relatively* more dependent on manufacturing and less dependent on AFFH than the American economy. The other way is to note that manufacturing in America is concentrated in Ohio, while AFFH is not. (A ratio of 1.00 indicates exactly proportional activity, neither concentrated nor sparse.)

The concentration of one sector or industry here means that another must be relatively sparse. In this sense, a broad description of Ohio's economy is illustrated by the chart above. It is driven a bit more by private sector activity than by government activity, as indicated by the concentration ratios of 1.02 and .87, respectively (orange and blue columns). Although overall goods-production is concentrated in the state (1.26, red), this principally reflects the concentration of manufacturing activity here (1.46) – with slightly more emphasis on nondurable than durable goods (1.48 vs. 1.43) – with mining concentrated here to a lesser degree (1.22). On the other hand, AFFH and construction activity are more or less sparse (.49 and .90, respectively).

The preceding section showed that service-providing industries collectively account for most economic activity in Ohio (77.41 percent with government, 66.75 percent without); yet the graph above shows that, as a whole, the collective contribution of non-governmental services to the GDP from Ohio is close to proportional with that of the nation (.95, yellow). However, this generalization masks considerable variability. The most notable departure is the concentration of enterprise management (1.65). The finance-insurance and health care-social assistance sectors are somewhat concentrated in Ohio at 1.23 and 1.16. Other service sectors that are roughly proportional with the national distribution include utilities, wholesale and retail trade, transportation-warehousing, administrative-support/waste-management, arts-entertainment-recreation, and other non-governmental services grouped in NAICS 81. Ohio's economy is comparatively less reliant on the remaining private service sectors.

More specific industry Ohio-U.S. comparison statistics follow on the next three pages.

See Table A1

Ohio and U.S. Gross Domestic Products by Industry, 2017 (current dollar figures in millions)

2012 NAICS Codes	Industry Titles	GDP Ohio	GDP U.S.	Ohio as a Percent of the U.S.	Ohio::U.S. Concentra-tion Ratio	Ohio's Rank	Top Five States
11-92	Total	$645,820	$19,485,394	3.31%	1.00	7	CA, TX, NY, FL, IL
11-81*	Private industries*	$574,997	$17,031,690	3.38%	1.02	7	CA, TX, NY, FL, IL
11, 21, 23, 31-33	Private goods producing industries	$141,734	$3,398,890	4.17%	1.26	***3***	CA, TX, ***OH*** , PA, IL
11	Agriculture, forestry, fishing, etc.	$2,772	$169,225	1.64%	0.49	20	CA, TX, WA, IA, NB
111-2	Crop & animal production (farms)	$2,299	$132,818	1.73%	0.52	19	CA, TX, IA, NE, IL
113-5	Forestry, fishing & related activities	$473	$36,407	1.30%	0.39	22	CA, WA, FL, TX, OR
21	Mining	$9,980	$268,619	3.72%	1.12	***5***	TX, OK, PA, CO, ***OH***
211	Oil & gas extraction	$8,380	$174,755	4.80%	1.45	***4***	TX, OK, PA, ***OH*** , CO
212	Mining, exc. oil & gas	$941	$54,228	1.73%	0.52	23	AZ, WY, WV, NV, PA
213	Support activities for mining	$659	$39,636	1.66%	0.50	11	TX, OK, LA, ND, CO
23	Construction	$24,426	$781,413	3.13%	0.94	7	CA, TX, FL, NY, PA
31-33	Manufacturing	$104,555	$2,179,633	4.80%	1.45	***3***	CA, TX, ***OH*** , IL, NC
32p & 33	Durable goods	$60,030	$1,226,648	4.89%	1.48	***4***	CA, TX, MI, ***OH*** , IN
321	Wood products	$1,123	$38,124	2.95%	0.89	14	OR, TX, CA, GA, PA
327	Nonmetallic mineral products	$3,485	$59,548	5.85%	1.77	***3***	TX, CA, ***OH*** , FL, NY
331	Primary metals	$6,067	$59,835	10.14%	3.06	***2***	IN, ***OH*** **,** PA, AL, MI
332	Fabricated metal products	$11,229	$151,870	7.39%	2.23	***3***	CA, TX, ***OH*** , IL, MI
333	Machinery	$9,158	$150,424	6.09%	1.84	***4***	TX, IL, CA, ***OH*** , MI
334	Computer & electronic products	$2,349	$281,124	0.84%	0.25	18	CA, TX, MA, OR, NC
335	Electrical eqpt. & appliances	$4,390	$58,527	7.50%	2.26	***1***	***OH*** , CA, TN, WI, NC
336	Transportation eqpt.	$18,801	$306,953	6.13%	1.85	6	MI, WA, TX, CA, IN
3361-3	Motor vehicles, bodies, trailers & parts	$11,765	$158,888	7.40%	2.23	***4***	MI, IN, TX, ***OH*** , TN
3364-9	Other transportation eqpt.	$7,037	$148,065	4.75%	1.43	***5***	WA, CA, TX, CT, ***OH***
337	Furniture & related products	$1,180	$31,347	3.76%	1.14	8	CA, MI, NC, IN, TX
339	Miscellaneous mfg.	$2,246	$88,896	2.53%	0.76	15	CA, IL, MN, MA, NJ
31 & 32p	Nondurable goods	$44,525	$952,985	4.67%	1.41	6	CA, TX, NC, IL, PA
311-2	Food, beverage & tobacco products	$11,919	$269,669	4.42%	1.33	7	CA, NC, VA, TX, IL
313-4	Textile & textile product mills	$331	$18,459	1.79%	0.54	14	GA, NC, SC, CA, NY
315-6	Apparel, leather & allied products	$158	$9,299	1.70%	0.51	12	CA, NY, TX, MA, NC
322	Paper	$2,218	$58,892	3.77%	1.14	9	WI, GA, PA, TN, CA
323	Printing & related support activities	$1,999	$39,180	5.10%	1.54	6	CA, IL, WI, PA, MN
324	Petroleum & coal products	$5,505	$120,698	4.56%	1.38	***5***	TX, CA, LA, IL, ***OH***
325	Chemical	$16,366	$353,975	4.62%	1.39	8	CA, TX, NC, IN, NJ
326	Plastics & rubber products	$6,029	$82,812	7.28%	2.20	***1***	***OH*** , IL, TX, PA, CA

Ohio and U.S. Gross Domestic Products by Industry, 2017 (current dollar figures in millions)

2012 NAICS Codes	Industry Titles	GDP Ohio	GDP U.S.	Ohio as a Percent of the U.S.	Ohio::U.S. Concentra-tion Ratio	Ohio's Rank	Top Five States
22, 42-81[1]	Private service providing industries[1]	$433,263	$13,632,799	3.18%	0.96	8	CA, NY, TX, FL, IL
22	Utilities	$10,571	$307,496	3.44%	1.04	7	CA, TX, NY, FL, IL
42	Wholesale trade	$40,501	$1,174,123	3.45%	1.04	9	CA, TX, NY, FL, IL
44-45	Retail trade	$39,053	$1,087,107	3.59%	1.08	7	CA, TX, NY, FL, WA
48-49*	Transportation & warehousing*	$20,780	$608,735	3.41%	1.03	9	CA, TX, FL, NY, IL
481	Air transportation	$2,296	$135,733	1.69%	0.51	19	CA, TX, FL, GA, IL
482	Rail transportation	$1,441	$40,479	3.56%	1.07	7	NE, TX, IL, MO, KS
483	Water transportation	$110	$14,026	0.79%	0.24	24	FL, CA, LA, TX, NY
484	Truck transportation	$7,384	$152,754	4.83%	1.46	***4***	CA, TX, IL, ***OH***, PA
485	Transit & ground passenger transportation	$649	$44,345	1.46%	0.44	17	NY, CA, IL, MA, NJ
486	Pipeline transportation	$2,266	$40,717	5.57%	1.68	6	TX, OK, PA, AK, CO
487-8, 492	Other transportation & support activities	$3,755	$117,085	3.21%	0.97	9	CA, TX, FL, NY, TN
493	Warehousing & storage	$2,878	$63,596	4.53%	1.37	6	CA, TX, PA, IL, NJ
51	Information	$18,078	$1,050,767	1.72%	0.52	14	CA, NY, WA, TX, PA
511	Publishing (inc. sofware, exc. Internet)	$5,342	$266,860	2.00%	0.60	14	CA, WA, NY, MA, TX
512	Motion pictures & sound recordings	$498	$91,408	0.55%	0.16	19	CA, NY, GA, FL, TX
515, 517	Broadcasting & telecommunications	$8,746	$428,939	2.04%	0.62	11	CA, NY, PA, TX, GA
518, 519	Data prcsng., hosting, other info. (inc. Internet)	$3,492	$263,559	1.32%	0.40	16	CA, NY, WA, TX, IL
52	Finance & insurance	$58,662	$1,465,909	4.00%	1.21	6	NY, CA, TX, IL, FL
521-2	Federal Reserve banks, credit intermediation, etc.	$27,764	$617,032	4.50%	1.36	6	NY, CA, TX, NC, IL
523	Securities, commodity contracts, investments	$4,042	$291,401	1.39%	0.42	15	NY, CA, MA, IL, TX
524	Insurance carriers & related activities	$26,648	$540,782	4.93%	1.49	6	NY, TX, IL, CA, FL
525	Funds, trusts & other financial vehicles	$209	$16,694	1.25%	0.38	15	CA, NY, TX, FL, GA
53	Real estate, rental & leasing	$71,433	$2,591,221	2.76%	0.83	10	CA, NY, TX, FL, IL
531	Real estate	$65,066	$2,367,513	2.75%	0.83	10	CA, NY, FL, TX, NJ
532-3	Rental & leasing srvcs. & lessors of intangible assets	$6,368	$223,707	2.85%	0.86	10	CA, TX, FL, NY, IL
54	Professional, scientific & technical srvcs.	$33,291	$1,449,993	2.30%	0.69	15	CA, NY, TX, FL, IL
5411	Legal srvcs.	$5,566	$257,791	2.16%	0.65	12	NY, CA, TX, IL, FL
5415	Computer systems design & related srvcs.	$7,584	$323,080	2.35%	0.71	15	CA, TX, VA, NY, MA
5412-4, 5416-9	Other professional, scientific & technical srvcs.	$20,141	$869,123	2.32%	0.70	15	CA, NY, TX, MA, FL
55	Management of companies & enterprises	$20,832	$369,380	5.64%	1.70	***5***	CA, NY, PA, TX, ***OH***

Ohio and U.S. Gross Domestic Products by Industry, 2017 (current dollar figures in millions)

2012 NAICS Codes	Industry Titles	GDP Ohio	GDP U.S.	Ohio as a Percent of the U.S.	Ohio::U.S. Concentration Ratio	Ohio's Rank	Top Five States
56	Administrative & waste srvcs.	$20,205	$606,974	3.33%	1.00	7	CA, TX, FL, NY, IL
561	Administrative & support srvcs.	$17,679	$546,226	3.24%	0.98	8	CA, TX, FL, NY, IL
562	Waste management & remediation srvcs.	$2,527	$60,748	4.16%	1.25	6	CA, TX, NY, WA, FL
61	Educational srvcs.	$6,124	$245,556	2.49%	0.75	13	NY, CA, PA, MA, IL
62	Health care & social assistance	$56,307	$1,454,718	3.87%	1.17	7	CA, NY, TX, FL, PA
621	Ambulatory health care srvcs.	$24,572	$708,287	3.47%	1.05	8	CA, TX, NY, FL, PA
622	Hospitals	$21,078	$473,442	4.45%	1.34	7	CA, NY, TX, FL, PA
623	Nursing & residential care facilities	$6,644	$146,281	4.54%	1.37	6	CA, NY, PA, FL, TX
624	Social assistance	$4,012	$126,709	3.17%	0.96	8	CA, NY, PA, TX, MA
71	Arts, entertainment & recreation	$7,571	$214,148	3.54%	1.07	7	CA, NY, FL, TX, IL
711-2	Performing arts, museums & related activities	$3,237	$125,669	2.58%	0.78	9	CA, NY, TX, FL, TN
713	Amusements, gambling & recreation	$4,334	$88,479	4.90%	1.48	6	CA, FL, NY, TX, IL
72	Accommodation & food srvcs.	$16,337	$590,589	2.77%	0.83	8	CA, TX, FL, NY, IL
721	Accommodation	$2,452	$163,175	1.50%	0.45	22	CA, FL, NV, NY, TX
722	Food srvcs. & drinking places	$13,885	$427,414	3.25%	0.98	6	CA, TX, NY, FL, IL
81	Other srvcs., exc. government	$13,518	$416,083	3.25%	0.98	7	CA, TX, NY, FL, IL
92, 491	Government	$70,823	$2,453,704	2.89%	0.87	10	CA, TX, NY, FL, VA
92fc, 92811, 491	Federal government	$15,567	$759,896	2.05%	0.62	12	CA, VA, MD, TX, DC
92fc, 491	Civilian (inc. Postal Service)	$11,331	$449,253	2.52%	0.76	12	CA, MD, DC, VA, TX
92811	Military	$4,236	$310,643	1.36%	0.41	13	CA, VA, TX, NC, FL
92sl	State & local	$55,256	$1,693,809	3.26%	0.98	7	CA, NY, TX, FL, IL

Notes and abbreviations: * - excludes Postal Service (491); exc. - except; inc. - including; info. - information; p - part; prcsng. - processing; srvcs. - services. Components may not sum to totals due to rounding.

Sources: U.S. Bureau of Economic Analysis (2019).

Prepared by: Office of Research, Ohio Development Services Agency. Phone 614/466-2116 (DL, 5/19).

The table beginning on page 10 highlights the major industries with comparatively large contributions to Ohio's 3rd-rank in manufacturing (NAICS code 31-33). (2018 figures for major industries are unavailable.) They include:

- the core of the motor vehicle industry: cars, trucks, trailers, RVs, their parts and accessories (NAICS codes 3361-3) – $11.77 billion, 7.40 percent of the U.S. industry total and the 4th-largest source of all such goods in the nation,
- other transportation equipment (aerospace, rail, water, motorcycles, etc., 3364-9) – $7.04 billion, 4.75 percent, 5th,
- fabricated metal products (332) – $11.23 billion, 7.39 percent, 3rd,
- machinery (333) – $9.16 billion, 6.09 percent, 4th,
- primary metal products (331) – $6.07 billion, 10.14 percent, 2nd,
- plastic and rubber products (326) – $6.03 billion, 7.28 percent, 1st,
- petroleum and coal products (324) – $5.51 billion, 4.56 percent, 5th,
- electrical equipment and appliances (335) – $4.39 billion, 7.50 percent, 1st, and
- nonmetallic mineral products (327) – $3.49 billion, 5.85 percent, 3rd.

The continuing development of oil and gas extraction in Ohio (211) – valued at $8.38 billion and 4th-ranked at 4.80 percent of national output – helped push the state to 3rd in total goods production (11, 23-33).

The table also lists service-providing industries making comparatively large contributions to Ohio's and the nation's GDP in 2017:

- banks (including Federal Reserve offices), savings-and-loans, credit unions, non-depository financing and related activities (521-2) – $27.76 billion, 4.50 percent, 6th,
- insurance carriers, agencies and related activities (524) – $26.65 billion, 4.93 percent, 6th,
- hospitals (622) – $21.08 billion, 4.47 percent, 7th,
- enterprise management (55) – $20.83 billion, 5.64 percent, 5th,
- truck transportation (484) – $7.38 billion, 4.83 percent, 4th,
- nursing and residential care facilities (623) – a $6.64 billion, 4.54 percent, 6th,
- amusements, gambling and recreation (713) – $4.33 billion, 4.90 percent, 6th,
- warehousing and storage (493) – $2.88 billion, 4.53 percent, 6th,
- waste management and remediation (562) – $2.53 billion, 4.16 percent, 6th, and
- pipeline transportation (486) – $2.27 billion, 5.57 percent, 6th, which follows the growth in oil and gas extraction.

OHIO'S RANKS AMONG THE STATES AND THE WORLD

States and the Larger Economies in the World

(in billions of dollars)

	Country Estimates (2017)		States – Total (2018)			States – Manufacturing (2018)		
Rank	Area	GDP*	Area	GDP^	Percent of U.S.	Area	GDP^	Percent of U.S.
	World	$127,800.0	United States	$20,494.1	100.00%	United States	$2,334.6	100.00%
1	China[1]	$23,210.0	California	$2,968.1	14.48%	California	$316.8	13.57%
2	United States	$19,490.0	Texas	$1,775.8	8.66%	Texas	$230.4	9.87%
3	India	$9,474.0	New York	$1,676.4	8.18%	***Ohio***	***$112.2***	***4.81%***
4	Japan	$5,443.0	Florida	$1,036.3	5.06%	Illinois	$108.4	4.64%
5	Germany	$4,199.0	Illinois	$864.6	4.22%	North Carolina	$103.6	4.44%
6	Russia	$4,016.0	Pennsylvania	$788.5	3.85%	Michigan	$102.3	4.38%
7	Indonesia	$3,250.0	***Ohio***	***$676.2***	***3.30%***	Indiana	$102.1	4.37%
8	Brazil	$3,248.0	New Jersey	$624.9	3.05%	Pennsylvania	$93.8	4.02%
9	United Kingdom	$2,925.0	Georgia	$588.2	2.87%	New York	$74.6	3.19%
10	France	$2,856.0	Massachusetts	$567.3	2.77%	Georgia	$64.6	2.77%
11	Mexico	$2,463.0	North Carolina	$565.8	2.76%	Wisconsin	$63.3	2.71%
12	Italy	$2,317.0	Washington	$563.2	2.75%	Washington	$63.1	2.70%
13	Turkey	$2,186.0	Virginia	$534.4	2.61%	Tennessee	$56.0	2.40%
14	South Korea	$2,035.0	Michigan	$528.0	2.58%	Florida	$55.9	2.39%
15	Spain	$1,778.0	Maryland	$412.9	2.01%	Massachusetts	$53.3	2.28%
16	Saudi Arabia	$1,775.0	Colorado	$368.8	1.80%	New Jersey	$52.7	2.26%
17	Canada	$1,774.0	Minnesota	$368.3	1.80%	Minnesota	$52.7	2.26%
18	Iran	$1,640.0	Indiana	$366.7	1.79%	Louisiana	$49.2	2.11%
19	Australia	$1,248.0	Tennessee	$365.6	1.78%	Virginia	$47.8	2.05%
20	Thailand	$1,236.0	Arizona	$346.8	1.69%	Missouri	$40.7	1.74%
21	Egypt	$1,204.0	Wisconsin	$337.0	1.64%	South Carolina	$38.7	1.66%
22	Taiwan	$1,189.0	Missouri	$317.7	1.55%	Kentucky	$38.7	1.66%
23	Poland	$1,126.0	Connecticut	$274.2	1.34%	Alabama	$38.0	1.63%
24	Nigeria	$1,121.0	Louisiana	$252.1	1.23%	Iowa	$35.7	1.53%
25	Pakistan[2]	$1,061.0	Oregon	$238.7	1.16%	Oregon	$34.8	1.49%
26	Malaysia	$933.3	South Carolina	$230.4	1.12%	Connecticut	$30.8	1.32%
27	Netherlands	$924.4	Alabama	$221.1	1.08%	Arizona	$29.9	1.28%
28	Argentina	$922.1	Kentucky	$208.3	1.02%	Kansas	$27.2	1.17%
29	Philippines	$877.2	Oklahoma	$200.0	0.98%	Colorado	$25.1	1.08%
30	South Africa	$767.2	Iowa	$190.2	0.93%	Maryland	$24.3	1.04%
31	Colombia	$711.6	Utah	$177.3	0.87%	Arkansas	$19.8	0.85%

States and the Larger Economies in the World
(in billions of dollars)

	Country Estimates (2017)		States – Totals (2018)			States – Manufacturing (2018)		
Rank	Area	GDP*	Area	GDP^	Percent of U.S.	Area	GDP^	Percent of U.S.
32	U.A.E.[3]	$696.0	Kansas	$167.0	0.82%	Utah	$19.2	0.82%
33	Bangladesh	$690.3	Nevada	$165.8	0.81%	Oklahoma	$19.1	0.82%
34	Iraq	$649.3	District of Columbia	$140.3	0.68%	Mississippi	$18.5	0.79%
35	Vietnam	$648.7	Arkansas	$128.1	0.62%	Nebraska	$14.1	0.60%
36	***Ohio***	***$645.8***	Nebraska	$123.0	0.60%	New Hampshire	$9.9	0.42%
37	Algeria	$630.0	Mississippi	$114.1	0.56%	Idaho	$9.2	0.40%
38	Belgium	$529.2	New Mexico	$99.4	0.49%	Nevada	$8.1	0.35%
39	Singapore	$528.1	Hawaii	$92.0	0.45%	West Virginia	$7.9	0.34%
40	Switzerland	$523.1	New Hampshire	$84.7	0.41%	Maine	$6.3	0.27%
41	Sweden	$518.0	West Virginia	$77.5	0.38%	South Dakota	$5.3	0.23%
42	Romania	$483.4	Idaho	$77.0	0.38%	Rhode Island	$5.3	0.23%
43	Kazakhstan	$478.6	Delaware	$75.0	0.37%	Delaware	$4.7	0.20%
44	Hong Kong[1]	$455.9	Maine	$64.4	0.31%	New Mexico	$4.0	0.17%
45	Chile	$452.1	Rhode Island	$61.0	0.30%	North Dakota	$4.0	0.17%
46	Austria	$441.0	North Dakota	$54.7	0.27%	Vermont	$3.2	0.14%
47	Peru	$430.3	Alaska	$54.0	0.26%	Montana	$3.1	0.13%
48	Venezuela	$381.6	South Dakota	$51.6	0.25%	Hawaii	$1.9	0.08%
49	Norway	$381.2	Montana	$49.0	0.24%	Alaska	$1.7	0.07%
50	Czechia	$375.9	Wyoming	$39.4	0.19%	District of Columbia	n.a.	n.a.
51	Ukraine	$369.6	Vermont	$33.7	0.16%	Wyoming	n.a.	n.a.

Notes and abbreviations: * - Purchasing Power Parity basis (U.S. CIA, 2019), except Ohio (U.S. BEA, 2019); special areas and overseas territories of countries are not included in their GDP, which is why (1) China and Hong Kong are listed separately; (2) fiscal year estimate; (3) U.A.E. – United Arab Emirates; ^ - initial, subject to revision; U.S. figures include overseas activities such as diplomatic and military missions; n.a. - not available. Sources: U.S. CIA (2019), U.S. BEA (2019).

If Ohio was a separate country, it would have the 36th largest economy in the world. The U.S. BEA's revised estimate of $645.8 billion for 2017 places Ohio between Vietnam and Algeria with estimated GDPs of $648.7 and $630.0 billion, respectively (U.S. CIA, 2018).[1]

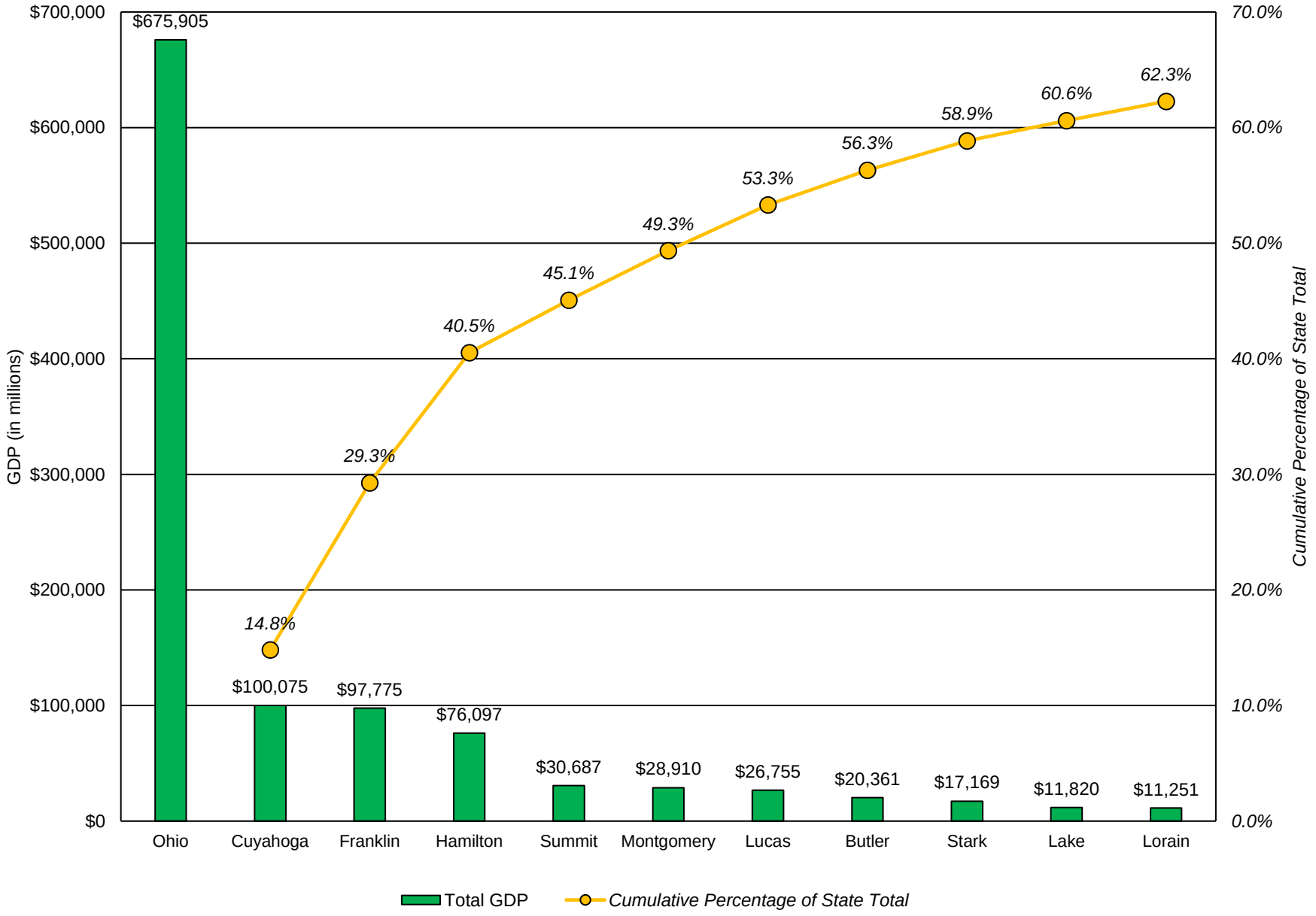
The table also shows that Ohio ranked 7th with 3.30 percent of U.S. total GDP and was the 3rd-ranked source for manufactured goods. The $112.2 billion in manufacturing output was 4.81 percent of the corresponding U.S. total, exceeding the output of four more populous states: Florida, Illinois, New York and Pennsylvania (U.S. BEA, 2019).

This page intentionally blank

THE GEOGRAPHY OF OHIO'S ECONOMY

2018 Total Gross Domestic Product

Ohio and the 10 Largest Counties



Source: U.S. BEA

THE DISTRIBUTION OF GROSS DOMESTIC PRODUCT BY COUNTY, 2018

The BEA recently published GDP estimates for counties. The chart above illustrates the 10 largest contributions by the *county-where-the-work-was-done* to Ohio's total GDP of $675.9 billion (as opposed to the counties' resident populations; some people cross county boundaries for work). In this sense, about $100.1 billion, or 14.8 percent, of Ohio's GDP originated in Cuyahoga, closely followed by Franklin at $97.8 billion with Hamilton at $76.1 billion. Individual figures for the next seven ranged between $30.7 and $11.2 billion (green columns).

The chart also illustrates the cumulative contributions of each of the 10 to Ohio's total output (gold dots). Cuyahoga and Franklin combined for 29.3 percent, with the addition of Hamilton raising the cumulative total of the three to 40.5 percent. The five largest counties combine for nearly 49.3 percent of Ohio's output, and the 10 accounted for 62.3 percent of the $675.9 billion total.

Tables on the following two pages list the contributions of all 88 counties in both rank and alphabetic order.

Ohio Counties 2018 Total Gross Domestic Products, Ranked by Size with Percentages

Rank	Area Name	GDP (in millions)	Percentages: Individual	Percentages: Cumulative
	Ohio	$675,905		
1	Cuyahoga	$100,075	14.81%	14.81%
2	Franklin	$97,775	14.47%	29.27%
3	Hamilton	$76,097	11.26%	40.53%
4	Summit	$30,687	4.54%	45.07%
5	Montgomery	$28,910	4.28%	49.35%
6	Lucas	$26,755	3.96%	53.31%
7	Butler	$20,361	3.01%	56.32%
8	Stark	$17,169	2.54%	58.86%
9	Lake	$11,820	1.75%	60.61%
10	Lorain	$11,251	1.66%	62.27%
11	Delaware	$10,855	1.61%	63.88%
12	Warren	$10,807	1.60%	65.48%
13	Greene	$9,777	1.45%	66.92%
14	Mahoning	$9,707	1.44%	68.36%
15	Clermont	$8,685	1.28%	69.64%
16	Allen	$8,221	1.22%	70.86%
17	Trumbull	$8,010	1.19%	72.05%
18	Wood	$7,131	1.05%	73.10%
19	Medina	$6,988	1.03%	74.13%
20	Belmont	$6,353	0.94%	75.07%
21	Licking	$6,296	0.93%	76.01%
22	Portage	$6,113	0.90%	76.91%
23	Hancock	$5,866	0.87%	77.78%
24	Wayne	$5,626	0.83%	78.61%
25	Erie	$5,489	0.81%	79.42%
26	Clark	$5,001	0.74%	80.16%
27	Richland	$4,886	0.72%	80.89%
28	Jefferson	$4,590	0.68%	81.56%
29	Miami	$4,569	0.68%	82.24%
30	Fairfield	$4,348	0.64%	82.88%
31	Geauga	$4,236	0.63%	83.51%
32	Union	$4,170	0.62%	84.13%
33	Muskingum	$3,962	0.59%	84.71%
34	Tuscarawas	$3,829	0.57%	85.28%
35	Washington	$3,673	0.54%	85.82%
36	Shelby	$3,323	0.49%	86.32%
37	Columbiana	$3,182	0.47%	86.79%
38	Ashtabula	$3,155	0.47%	87.25%
39	Scioto	$3,047	0.45%	87.70%
40	Marion	$2,953	0.44%	88.14%
41	Sandusky	$2,941	0.44%	88.58%
42	Ross	$2,921	0.43%	89.01%
43	Monroe	$2,797	0.41%	89.42%
44	Fayette	$2,666	0.39%	89.82%
45	Guernsey	$2,620	0.39%	90.20%
46	Gallia	$2,480	0.37%	90.57%
47	Auglaize	$2,476	0.37%	90.94%
48	Holmes	$2,470	0.37%	91.30%
49	Huron	$2,427	0.36%	91.66%
50	Mercer	$2,333	0.35%	92.01%
51	Fulton	$2,184	0.32%	92.33%
52	Clinton	$2,180	0.32%	92.65%
53	Carroll	$2,178	0.32%	92.97%
54	Athens	$2,166	0.32%	93.30%
55	Knox	$2,153	0.32%	93.61%
56	Logan	$2,148	0.32%	93.93%
57	Ottawa	$2,074	0.31%	94.24%
58	Pike	$2,036	0.30%	94.54%
59	Darke	$2,017	0.30%	94.84%
60	Seneca	$1,901	0.28%	95.12%
61	Pickaway	$1,895	0.28%	95.40%
62	Madison	$1,887	0.28%	95.68%
63	Lawrence	$1,865	0.28%	95.95%
64	Defiance	$1,856	0.27%	96.23%
65	Ashland	$1,843	0.27%	96.50%
66	Williams	$1,772	0.26%	96.76%
67	Harrison	$1,504	0.22%	96.99%
68	Coshocton	$1,462	0.22%	97.20%
69	Van Wert	$1,432	0.21%	97.41%
70	Putnam	$1,416	0.21%	97.62%
71	Crawford	$1,383	0.20%	97.83%
72	Henry	$1,278	0.19%	98.02%
73	Preble	$1,258	0.19%	98.20%
74	Highland	$1,198	0.18%	98.38%
75	Champaign	$1,196	0.18%	98.56%
76	Wyandot	$1,109	0.16%	98.72%
77	Hardin	$1,045	0.15%	98.88%
78	Jackson	$1,010	0.15%	99.03%
79	Adams	$953	0.14%	99.17%
80	Noble	$939	0.14%	99.31%
81	Brown	$901	0.13%	99.44%
82	Perry	$800	0.12%	99.56%
83	Hocking	$674	0.10%	99.66%
84	Morrow	$628	0.09%	99.75%
85	Paulding	$615	0.09%	99.84%
86	Meigs	$411	0.06%	99.90%
87	Morgan	$332	0.05%	99.95%
88	Vinton	$327	0.05%	100.00%

Source: U.S. Bureau of Economic Analysis, Gross Domestic Product (GDP) by County [machine-readable data file] / prepared by the Bureau. Washington, D.C.: the Bureau [producer and distributor], 2019. Table CAGDP2.

Prepared by: Office of Research, Ohio Development Services Agency. Telephone 614-466-2116 (DL, 12/19).

Ohio Counties 2018 Total Gross Domestic Products, with Ranks and Percentages, in Alphabetic Order

Area Name	GDP (in millions)	Percent of Ohio	Rank
Ohio	$675,905	100.0%	
Adams	$953	0.14%	79
Allen	$8,221	1.22%	16
Ashland	$1,843	0.27%	65
Ashtabula	$3,155	0.47%	38
Athens	$2,166	0.32%	54
Auglaize	$2,476	0.37%	47
Belmont	$6,353	0.94%	20
Brown	$901	0.13%	81
Butler	$20,361	3.01%	7
Carroll	$2,178	0.32%	53
Champaign	$1,196	0.18%	75
Clark	$5,001	0.74%	26
Clermont	$8,685	1.28%	15
Clinton	$2,180	0.32%	52
Columbiana	$3,182	0.47%	37
Coshocton	$1,462	0.22%	68
Crawford	$1,383	0.20%	71
Cuyahoga	$100,075	14.81%	1
Darke	$2,017	0.30%	59
Defiance	$1,856	0.27%	64
Delaware	$10,855	1.61%	11
Erie	$5,489	0.81%	25
Fairfield	$4,348	0.64%	30
Fayette	$2,666	0.39%	44
Franklin	$97,775	14.47%	2
Fulton	$2,184	0.32%	51
Gallia	$2,480	0.37%	46
Geauga	$4,236	0.63%	31
Greene	$9,777	1.45%	13
Guernsey	$2,620	0.39%	45
Hamilton	$76,097	11.26%	3
Hancock	$5,866	0.87%	23
Hardin	$1,045	0.15%	77
Harrison	$1,504	0.22%	67
Henry	$1,278	0.19%	72
Highland	$1,198	0.18%	74
Hocking	$674	0.10%	83
Holmes	$2,470	0.37%	48
Huron	$2,427	0.36%	49
Jackson	$1,010	0.15%	78
Jefferson	$4,590	0.68%	28
Knox	$2,153	0.32%	55
Lake	$11,820	1.75%	9
Lawrence	$1,865	0.28%	63
Licking	$6,296	0.93%	21
Logan	$2,148	0.32%	56
Lorain	$11,251	1.66%	10
Lucas	$26,755	3.96%	6
Madison	$1,887	0.28%	62
Mahoning	$9,707	1.44%	14
Marion	$2,953	0.44%	40
Medina	$6,988	1.03%	19
Meigs	$411	0.06%	86
Mercer	$2,333	0.35%	50
Miami	$4,569	0.68%	29
Monroe	$2,797	0.41%	43
Montgomery	$28,910	4.28%	5
Morgan	$332	0.05%	87
Morrow	$628	0.09%	84
Muskingum	$3,962	0.59%	33
Noble	$939	0.14%	80
Ottawa	$2,074	0.31%	57
Paulding	$615	0.09%	85
Perry	$800	0.12%	82
Pickaway	$1,895	0.28%	61
Pike	$2,036	0.30%	58
Portage	$6,113	0.90%	22
Preble	$1,258	0.19%	73
Putnam	$1,416	0.21%	70
Richland	$4,886	0.72%	27
Ross	$2,921	0.43%	42
Sandusky	$2,941	0.44%	41
Scioto	$3,047	0.45%	39
Seneca	$1,901	0.28%	60
Shelby	$3,323	0.49%	36
Stark	$17,169	2.54%	8
Summit	$30,687	4.54%	4
Trumbull	$8,010	1.19%	17
Tuscarawas	$3,829	0.57%	34
Union	$4,170	0.62%	32
Van Wert	$1,432	0.21%	69
Vinton	$327	0.05%	88
Warren	$10,807	1.60%	12
Washington	$3,673	0.54%	35
Wayne	$5,626	0.83%	24
Williams	$1,772	0.26%	66
Wood	$7,131	1.05%	18
Wyandot	$1,109	0.16%	76

Source: U.S. Bureau of Economic Analysis, Gross Domestic Product (GDP) by County [machine-readable data file] / prepared by the Bureau. Washington, D.C.: the Bureau [producer and distributor], 2019. Table CAGDP2.

Prepared by: Office of Research, Ohio Development Services Agency. Telephone 614-466-2116 (DL, 12/19).

COUNTY CONTRIBUTIONS TO OHIO'S GROSS DOMESTIC PRODUCT BY SECTOR, 2018

The list below names the top 10 counties contributing to Ohio's 20 economic sectors. The counties are listed in rank order with the cumulative percentage contributions of the top five and top 10 in the column at right. An asterisk (*) indicates the sector is concentrated in the county at a ratio of 1.1::1 or greater when compared to the U.S. distribution of goods and services provision. The sectors are in descending order of their concentration in the top five counties; the previously seen economy-wide summary included for comparison. Sectors less than the economy-wide summary of 49.3 and 62.3 percent for the top five and 10 counties may be thought of as more widely diffused across the state. Appendix Table A2 shows sector and super-sector data for the U.S., Ohio and all its 88 counties.

Sector	Cumulative Percent of Ohio
Mining, Quarrying and Oil-and-Gas Extraction (1.91 percent of Ohio's total GDP)	
1-5: Belmont*, Monroe*, Jefferson*, Guernsey*, Harrison*	76.4
6-10: Carroll*, Noble*, Wayne*, Columbiana*, Tuscarawas*	90.7
Arts, Entertainment and Recreation (1.17 percent of Ohio's total GDP)	
1-5: Cuyahoga*, Erie*, Hamilton*, Franklin, Summit	72.7
6-10: Lucas, Delaware*, Montgomery, Warren*, Stark	85.5
Finance and Insurance (9.07 percent of Ohio's total GDP)	
1-5: Cuyahoga*, Franklin*, Hamilton*, Butler*, Summit	70.7
6-10: Montgomery, Delaware*, Stark, Lucas, Clermont*	81.9
Professional-Scientific-Technical Services (5.17 percent of Ohio's total GDP)	
1-5: Cuyahoga, Franklin, Hamilton, Summit, Montgomery	68.6
6-10: Greene*, Lucas, Delaware*, Stark, Warren	82.1
Information (2.73 percent of Ohio's total GDP)	
1-5: Franklin, Cuyahoga, Hamilton, Montgomery*, Summit	68.4
6-10: Lucas, Warren, Stark, Delaware, Greene	78.0
Enterprise Management (3.11 percent of Ohio's total GDP)	
1-5: Hamilton*, Franklin*, Cuyahoga*, Summit*, Delaware*	65.8
6-10: Warren*, Lucas*, Hancock*, Montgomery, Medina*	79.1
Educational Services (0.92 percent of Ohio's total GDP)	
1-5: Cuyahoga*, Franklin, Hamilton, Montgomery*, Lorain*	63.1
6-10: Lucas, Summit, Stark, Greene*, Knox*	76.0
Wholesale Trade (6.37 percent of Ohio's total GDP)	
1-5: Cuyahoga*, Hamilton*, Franklin, Summit*, Butler*	57.8
6-10: Montgomery, Lucas, Stark, Warren*, Mahoning*	71.4

Sector	Cumulative Percent of Ohio
Health Care-Social Assistance (8.66 percent of Ohio's total GDP)	
1-5: Cuyahoga*, Franklin*, Hamilton*, Montgomery*, Summit*	56.7
6-10: Lucas*, Stark*, Butler, Mahoning*, Lorain*	71.0
Administrative-Support/Waste-Management-Remediation (3.13 percent of Ohio's total GDP)	
1-5: Franklin*, Cuyahoga, Hamilton, Summit*, Montgomery	56.0
6-10: Lucas, Butler, Stark, Mahoning*, Warren*	69.3
Governments and Their Enterprises (10.67 percent of Ohio's total GDP)	
1-5: Franklin*, Cuyahoga, Hamilton, Greene*, Montgomery	51.6
6-10: Lucas, Summit, Butler, Stark, Lorain	65.6
Real Estate-Rental-Leasing (11.04 percent of Ohio's total GDP)	
1-5: Cuyahoga, Franklin, Hamilton, Montgomery, Summit	51.0
6-10: Lucas, Stark, Butler, Lorain, Mahoning	64.7
Summary GDP in Ohio (100.0 percent)	
1-5: Cuyahoga, Franklin, Hamilton, Summit, Montgomery	**49.3**
6-10: Lucas, Butler, Stark, Lake, Lorain	**62.3**
Accommodation-Food Services (2.49 percent of Ohio's total GDP)	
1-5: Franklin, Cuyahoga, Hamilton, Montgomery, Summit	48.3
6-10: Lucas, Stark, Butler, Delaware* Trumbull*	63.1
Other Private Sector Services (2.07 percent of Ohio's total GDP)	
1-5: Franklin, Cuyahoga, Hamilton, Summit, Montgomery	46.2
6-10: Lucas, Stark*, Butler, Warren*, Lake*	60.6
Transportation-Warehousing (3.32 percent of Ohio's total GDP)	
1-5: Franklin*, Cuyahoga, Clermont*, Hamilton, Hancock*	45.5
6-10: Montgomery, Lucas, Summit, Butler, Wood*	61.2
Utilities (1.62 percent of Ohio's total GDP)	
1-5: Gallia*, Jefferson*, Lake*, Washington*, Ottawa*	43.4
6-10: Lawrence*, Franklin, Hamilton, Lucas, Carroll*	65.7
Construction (3.69 percent of Ohio's total GDP)	
1-5: Franklin, Hamilton, Cuyahoga, Summit, Montgomery	42.5
6-10: Butler*, Lucas, Stark*, Medina*, Warren*	57.3
Retail Trade (5.87 percent of Ohio's total GDP)	
1-5: Franklin, Cuyahoga, Hamilton, Summit*, Lucas*	42.4
6-10: Montgomery, Butler*, Stark*, Warren*, Delaware*	58.0

Sector	Cumulative Percent of Ohio
Manufacturing (16.60 percent of Ohio's total GDP)	
1-5: Hamilton, Cuyahoga, Franklin, Lucas*, Summit	35.9
6-10: Allen*, Butler*, Stark*, Lake*, Montgomery	52.8
Agriculture-Forestry-Fishing-Hunting (0.40 percent of Ohio's total GDP)	
1-5: Mercer*, Van Wert*, Pickaway*, Auglaize*, Lake*	23.3
6-10: Hardin*, Marion*, Holmes*, Lorain*, Preble*	37.9

These lists show the effects of several factors. Sometimes it is the sheer size of the counties' populations that leads to their high sector ranks; other times it is the relatively large presence of one sector regardless of a county's population size. Sometimes the concentration reflects the tendency of more specialized sectors to locate in larger counties, which may in turn reflect either or both sufficiently large markets for sales and for workers with desired skills; other times it may be the presence of particular resources or the lack of large urban populations.[2]

Drawn from Table A2

This page intentionally blank

2018 Gross Domestic Product for Multi-county Metropolitan Areas in Ohio (in millions)

		Private Sector								Governments	
				Goods-Producing				Service-Providing			
						Manufacturing					
Area (number of Ohio counties)	Total	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Aggregate Amounts											
U.S.	$20,580,223	$18,035,586	87.6%	$3,673,443	17.8%	$2,321,192	11.3%	$14,362,142	69.8%	$2,544,637	12.4%
Ohio	$675,905	$603,476	89.3%	$154,009	22.8%	$111,491	16.5%	$449,467	66.5%	$72,429	10.7%
Akron (2)	$36,800	$32,950	89.5%	(D)	(D)	$5,437	14.8%	(D)	(D)	$3,850	10.5%
Canton-Massillon (2)	$19,347	$17,722	91.6%	$5,698	29.5%	$3,846	19.9%	$12,024	62.2%	$1,625	8.4%
Cincinnati (three states)	$141,053	$129,487	91.8%	(D)	(D)	$21,380	15.2%	(D)	(D)	$11,565	8.2%
Cincinnati (Ohio part, 5)*	$116,851	$107,787	92.2%	(D)	(D)	$17,838	15.3%	(D)	(D)	$9,064	7.8%
Cleveland-Elyria (5)	$134,370	$120,985	90.0%	(D)	(D)	$19,171	14.3%	(D)	(D)	$13,384	10.0%
Columbus (10)	$129,328	$111,466	86.2%	$18,529	14.3%	$12,978	10.0%	$92,937	71.9%	$17,862	13.8%
Dayton-Kettering (3)	$43,255	$35,520	82.1%	(D)	(D)	$5,619	13.0%	(D)	(D)	$7,735	17.9%
Toledo (4)	$38,143	$34,119	89.5%	$10,823	28.4%	$9,111	23.9%	$23,297	61.1%	$4,024	10.5%
Youngstown-Warren... (two states)	$22,281	$19,824	89.0%	$5,078	22.8%	$3,834	17.2%	$14,746	66.2%	$2,457	11.0%
Youngstown-Warren... (Ohio part, 2)^	$17,717	$15,722	88.7%	$3,890	22.0%	$2,922	16.5%	$11,833	66.8%	$1,995	11.3%
Percentage of Ohio											
Sum of the Eight	79.3%	78.9%				69.0%				82.2%	
Akron (2)	5.4%	5.5%				4.9%				5.3%	
Canton-Massillon (2)	2.9%	2.9%				3.4%				2.2%	
Cincinnati (Ohio part, 5)*	17.3%	17.9%				16.0%				12.5%	
Cleveland-Elyria (5)	19.9%	20.0%				17.2%				18.5%	
Columbus (10)	19.1%	18.5%				11.6%				24.7%	
Dayton-Kettering (3)	6.4%	5.9%				5.0%				10.7%	
Toledo (4)	5.6%	5.7%				8.2%				5.6%	
Youngstown-Warren... (Ohio part, 2)^	2.6%	2.6%				2.6%				2.8%	

Notes: * - Brown, Butler, Clermont, Hamilton and Warren Counties summed; ^ - Mahoning and Trumbull Counties summed; (D) - Suppressed to maintain confidentiality for some local enterprises - usually the agricultural sector.

Source: U.S. Bureau of Economic Analysis, Gross Domestic Product (GDP) by County [machine-readable data file] / prepared by the Bureau. Washington, D.C.: the Bureau [producer and distributor], 2019. Table CAGDP2.

Prepared by: Office of Research, Ohio Development Services Agency (DL, 12/19).

THE DISTRIBUTION OF GROSS DOMESTIC PRODUCTS IN METROPOLITAN AREAS, 2018

The BEA also publishes GDP data for metropolitan areas (MAs). MAs are counties or clusters of adjacent counties with a core urbanized area of at least 50,000 people. (Urbanized areas include large cities, their suburbs and densely populated unincorporated areas.) Multi-county MAs have a high degree of social and economic integration with one another, and typically are named after the principal city or cities. The table above shows the GDPs for six multi-county MAs wholly in Ohio and two crossing state boundaries; Ohio portions also are shown for Cincinnati and Youngstown-Warren-Boardman. (One-county MAs are part of the county tables.) While Cincinnati is the largest MA shown above at $141.1 billion, its Ohio portion, $116.9 billion, ranks it third in the state after Cleveland-Elyria and Columbus with $134.4 and $129.3 billion, respectively. The three are by far the largest, combining to produce a value equal to 56.3 percent of the state's 2018 GDP as judged by the Ohio portions alone. Akron, Dayton-Kettering and Toledo clustered between $36 billion and $44 billion, while Canton-Massillon and the Ohio portion of Youngstown were in the $17-$20 billion range. Altogether, the eight produced 79.3 percent of Ohio's 2018 GDP.

The table above also displays some of the amounts and percentages of GDP derived from manufacturing and government services. (Encompassing private goods producing cluster figures are not disclosed to maintain confidentiality – usually for local agricultural, etc. enterprises. This results in complementary suppression of the private service providing cluster.) Several characteristics are notable in this regard:

- Cincinnati, Cleveland and Columbus are the three largest sources for manufactured goods, combining for 44.8 percent of Ohio's total production;
- Despite their large absolute outputs, their *portions* of total GDP derived from manufacturing tend to be relatively low; in Cincinnati's and Cleveland's cases, both portions are a little less than the state average; in Columbus' case, the portion is less than the state and U.S. averages;
- Akron and Dayton have manufacturing portions that are between the state and U.S. portions;
- Canton, Toledo and Youngstown – three of the smaller MAs – have manufacturing portions greater than Ohio's portion.

Federal, state and local governments combined contributions to the MAs' GDPs ranged from 7.8 percent in the Ohio portion of Cincinnati to 17.9 percent in Dayton. The relatively high percentage for Dayton incorporates the importance of Wright-Patterson Air Force Base in its economy. However, Columbus contributed 24.7 percent of Ohio's total government GDP – due in part to its large size, the bulk of state government, a large federal agency, and the Ohio State University.

This page intentionally blank

RECENT CHANGES IN OHIO'S ECONOMY

GROSS DOMESTIC PRODUCT FROM OHIO: 1998-2018

The chart above shows that the total value of goods and services produced in Ohio rose from $361.6 to $495.7 billion in the years 1998 to 2008 but fell to $480.3 billion in 2009 before rising to $676.2 billion in 2018. Figures for goods production (red and white stripes) show more ups and downs (in billions): up from $106.6 in 1998 to $108.4 in 2000, down to $101.7 in 2001, up to $116.9 in 2007, down to $97.5 in 2009, up to $152.7 in 2018. This contrasts with the relatively steady rise in the nominal value of private sector services (yellow) from $215.2 to $451.3; 2009 was the exception. The value of government services (blue) appeared to rise without interruption from $39.9 to $72.1. It is important to note that the chart above makes no adjustment for inflation. Consequently, it cannot be determined from the current-dollar figures how much of the year-to-year changes seen above are due to real economic growth, and how much are due to simple price increases. That issue is addressed beginning in the next section.

The graph also illustrates the reorientation of economic activity in Ohio's private sector away from goods production and towards services. The net change in the portion of output was a decrease in goods production from 29.5 to 22.6 percent of output, while private sector services rose from 59.5 to 66.7 percent. Government services fluctuated but were marginally less: 11.0 percent in 1998 and 10.7 percent in 2018.

What happened in Ohio was part of the larger but less-pronounced shift for the nation as a whole. The private goods-producing sectors' share of total U.S. GDP fell from 22.0 to 17.9 percent, while the complementary share of service providers rose from 64.9 to 69.9 percent. Government services also were marginally less: 12.2 percent in 2018 vs. 13.1 percent in 1998 (U.S. BEA, 2019).[3]

REMOVING THE EFFECTS OF INFLATION

Removing the effects of inflation permits comparisons across the years of the *volumes* of goods produced and services provided, revealing in the chart above the expansion and contraction in Ohio's economic output over the course of two decades. (Figures have been standardized on 2012.) Total GDP figures (gray dots) show real growth in the output of goods and services in Ohio from 1998 to 2000, a recession in 2001, the resumption of growth in 2002 continuing through 2005, almost unchanging output in 2006 and 2007, the "Great Recession" in 2008 and 2009, and the current recovery and expansion in 2010 to 2018. (The most current data (U.S. BEA, 2019) indicate real grow continued through the first quarter of 2019 at an average annual rate of 3.5 percent.) The 5.9 percent plunge from $541.4 to $509.2 billion (2007-2009) wiped out 81.3 percent of the net growth from 2001 to 2007. It was not until 2013 that total output in Ohio surpassed the pre-recession peak of 2005. This history almost entirely reflects expansion and contraction in the private sector (orange squares); government services (blue dots) decreased from a peak of $66.0 billion in 2000 to $62.2 billion in 2018, a slight change in context of the total economy.

The chart above further specifies where changes occurred in the private sector. The collective output of goods producers (dark red diamonds) peaked at $138.3 billion in 2000, fell to $127.3 billion (2001), then grew to $138.7 billion (2004) before sliding – gradually at first – to $107.9 billion (2009). Aggregate output has since grown, reaching $139.5 billion in 2018. These changes largely reflect variations in manufacturing output (red triangles), and data derived from Appendix Table A2 show most of the manufacturing volume changes occurred in the durable goods subsector:

	`98-`00	`00-`01	`01-`07	`07-`09	`09-`18
All goods production (billions)	+$1.5	-$11.0	+$7.2	-$26.6	+$31.6
Manufacturing (billions)	+$1.2	-$8.5	+$12.2	-$25.4	+$18.8
Durable goods (billions)	+$1.4	-$7.1	+$9.2	-$23.4	+$18.0.

Much of the residual change among goods producers seen in the chart is due to the long-term net decline in construction, which has been more than offset by the phenomenal growth in mining output after 2012.

By contrast, the collective output of private sector service-providers (yellow dots) increased nearly every year, declining 1.7 percent by 2009 from the pre-recession peak in 2007. Expansion resumed by 2010, passed the pre-recession peak in 2011 and has continued. Some sectors showed greater-than-average growth over two decades: information, finance/insurance, professional/scientific/technical services, enterprise management, administrative-support/waste-management, and health care and social assistance; wholesale trade was close to the long-term cluster average of 38.8 percent. Most private sector services declined or merely stalled in the recession of 2008-2009 but resumed growing after 2009; a few have fluctuated or contracted. Analyses of specific sectors and their constituent industries follow.

See Table A3

MOTOR VEHICLES AND OTHER CONCENTRATED DURABLE GOODS INDUSTRIES

The preceding section pointed to the ups and downs in durable goods manufacturing as accounting for much of the variation in Ohio's total goods production and – ultimately – a disproportionately large role in expansion and contraction of the state's economy as a whole. The chart above shows one prominent part of that variability was the striking contraction and recovery in the motor vehicle industry: cars, trucks, RVs, trailers and their parts and accessories (collectively NAICS 3361-3363, red squares). The changes were the most extreme among all industries in Ohio: plunging $11.53 billion – 76.2 percent – from 2007 to 2009 but rebounding only $7.47 billion by 2014. Despite this 200.7 percent growth, industry output of 2014 was 73.2 percent of that of 2007. Output has since contracted to $9.53 billion. (Amounts and percentages have been adjusted for inflation.) Factors partially explaining why industry output remains less than pre-recession levels include:

- the permanent closures of GM's Moraine assembly and Mansfield parts plants as well as Ford's Cleveland engine plant #2 and Walton Hills stamping plant in the recession's aftermath;
- Ford closed its Cleveland engine plant #1 for a year beginning in May 2007 (#2 was still operating);
- floods at east Asian parts plants constrained Honda's assemblies in 2011-2012;
- FCA shut its Toledo North assembly plant for about nine months in 2012-2013 for a major model change-over; and
- light vehicles assemblies have decreased for two consecutive years since 2015 due in part to more major model changeovers at FCA's Toledo complex combined with a declining demand for cars as buyers shifted to light trucks (Automotive News, 2016-2019).

The changes seen in Ohio were part of nationwide industry changes: output fell 66.1 percent from 2007 to 2009 and then rose almost without interruption, finally surpassing the 2007 pre-recession peak in 2017. Although 7.4 percent of U.S. motor vehicle output still comes from Ohio, the industry is less concentrated here in 2017 than it was in 2007.

With few exceptions, GDP data provide no information about industry groups within major industries. However, value-added data from the Census Bureau's Annual Survey of Manufactures (ASM) and employment figures from its County Business Patterns (CBP) files do, providing more specific insights.[4] Both ASM and CBP data indicate that vehicle assembly (3361) and parts production (3363) are particularly concentrated in Ohio, while manufacturing bodies and trailers (3362) is closer to proportional with the nation (see Appendix Tables A19 and A21). Additional data confirm this concentration in assembly and parts production: Ohio was the 4th-ranked state with 10.4 percent of U.S.-made cars, vans, pick-ups and sport-utility vehicles assembled at seven plants in 2017 (Automotive News, 2019) as well as tens of thousands of medium- and heavy-duty trucks assembled at three plants.[5] Ohio also had the 2nd largest number of U.S. establishments (regardless of NAICS codes) supplying parts to vehicle assemblers (ELM Analytics, 2018).

The extreme changes in the motor vehicle industry contrast with the less dramatic contraction and recovery in manufacturing other transportation equipment: aerospace, railroad and water-faring vehicles, equipment and parts, as well as land-based vehicles such as ATVs, motorcycles, bicycles, tanks, golf carts, etc. and their parts (collectively 3364-3369, blue dots). Output from this cluster fell 27.3 percent from 2007 to 2012; recovery and expansion were underway by 2013 and surpassed pre-recession levels in 2016. These changes are similar to those seen nationwide, and this cluster remains as concentrated here now as it was in 2007.

ASM data specify the source of this cluster's concentration here to aerospace products and parts (3364); 4.6 percent of the U.S. industry's value-added originated here. On the other hand, CBP data show only 3.4 percent of U.S. industry jobs in Ohio. This divergence may principally reflect the very high value added with large jet engines from GE Aviation's Evendale plant. Neither output from, nor employment in, any other transportation equipment group – railroad, water-faring and other land-based vehicles – (3365-3369) is concentrated here (U.S. Bureau of the Census, 2018, 2019b).

The chart above illustrates changes in the inflation-adjusted output from 2007 through 2017 of six more major durable goods industries currently concentrated in Ohio. Output from the primary and fabricated metals industries as well as the furniture industry (NAICS 331, 332 and 337, darker blue shapes and orangish rectangles) each fell more than 30 percent from their 2007 levels to their nadirs, and output from the machinery and electrical equipment/appliances industries (333 and 335, light blue diamonds and black stars) each fell more than 25 percent. The primary metals and machinery industries have recovered to or surpassed their 2007 levels, but 2017 output levels for the three others remain below their 2007 levels. The only industry not severely affected by the Great Recession has been non-metallic mineral products (327, light gray squares), which appears to have fluctuated with no obvious long-term trend.

These patterns of changes in output from Ohio again are part of and frequently similar to national industry changes: primary metals, machinery and electrical equipment/appliances output fell and rebounded past its 2007 peaks (but the latter two have since slipped); fabricated metals and furniture output fell and remain below their pre-recession peak despite some recovery. The exception is output from non-metallic mineral industries, which fell in the recession and has remained below its pre-recession peak.

ASM and CBP data again provide additional insights. All primary metals group activities are concentrated in Ohio: iron and steel mills and ferroalloy production (3311), steel products made from purchased steel (3312), aluminum smelting and subsequent production (3313) as well as producing other common metals (3314, principally copper). Foundry output and employment (3315) also are concentrated here (U.S. Bureau of the Census, 2018, 2019b). Appendix Tables A19 and A21 show the highest concentrations in the four iron and steel, copper and foundry groups. Data from the U.S. Geological Survey (2019) confirm Ohio's prominent role in steel production: typically, 11 to 14 percent of U.S. raw steel production has come from Ohio in recent years, ranking it 2nd.

Output from all nine fabricated metal groups (332) is concentrated in Ohio to various degrees (U.S. Bureau of the Census, 2018, 2019b). Output includes shaping metal pieces by forging, heat-treating, coating, stamping, bending, forming, machining, engraving and/or welding purchased materials. (Stampings for motor vehicles are classified as motor vehicle parts – 33637.) Products include cutlery, unpowered hand tools, boilers, containers, hardware, nuts, bolts, screws, rivets, wires, springs, valves and plumbing fixtures, bearings, safes, ladders, washers, tanks, and the output of machine shops. (Washing machines and military weapons are classified elsewhere.) In this case, ASM and CBP data lead to the conclusion that it is the combination of a variety of goods made in large volumes that results in Ohio's 3rd rank in industry GDP.

Machinery manufacturing output is concentrated to varying degrees in five of the seven industry groups: the more-focused industrial, commercial and service machinery industries (3332 and 3333), and the more widely applicable heating-ventilation-air conditioning (HVAC) and commercial refrigeration equipment (3334), metalworking (3335) and general-purpose machinery (3339) groups. CBP data show employment in the engines-turbines-power transmission equipment group (3336) is concentrated, but ASM data do not (U.S. Bureau of the Census, 2018, 2019b).[6] Again, it is the combination of a variety of goods made in large volumes that results in Ohio's overall 4th rank in industry GDP.

Ohio is the top-ranked source in the U.S. for electrical equipment and appliances. ASM and CBP data show this rank is due to the overwhelming concentration in household appliances (3352); 24.8 percent of U.S. value-added for the group comes from Ohio and 22.4 percent of U.S. group jobs are located here – by far the largest percentages among the states. ASM and CBP data suggest milder concentrations or nearly proportional activity and jobs in the three other groups: electric lighting equipment (3351); electrical equipment (3353) such as motors, generators, transformers, switching equipment, relays and industrial controls (turbines for generating electricity are classified elsewhere); and other electrical equipment and components (3359) such as batteries, wires and cables (U.S. Bureau of the Census, 2018, 2019b).

Manufacturing non-metallic mineral products (mainly from silicates and calcites, 327) is concentrated in Ohio. ASM and CBP data agree that three of the five groups are concentrated here: clay and refractory products such as china, bricks, earthenware, pottery, porcelain, wall tiles, etc. (3271), glass (3272) and other materials (3279, abrasives, cut-stone products, fiberglass, stucco, etc.) (U.S. Bureau of the Census, 2018, 2019b). As before, it is the combination of a variety of goods made in large volumes that results in Ohio's overall 3rd rank in industry GDP. The output of household and institutional furniture and kitchen cabinets (3371) appears mildly concentrated here (U.S. Bureau of the Census, 2018, 2019b).

These seven major durable goods industries concentrated here – nonmetallic minerals, primary and fabricated metals, machinery, electrical equipment and appliances, transportation equipment, and furniture and related products – comprised 90.5 percent of all durable goods production in Ohio during 2017. Bearing that in mind, the estimated real increase of 4.3 percent in 2018 for all durable goods production probably indicates most – if not all – of the seven grew in 2018. The 4.3

percent was part of the 5.4 percent real increase in all durable goods production seen nationwide.

See Tables A3, A4, A15-A17, A19, A21

CONCENTRATED NON-DURABLE GOODS MANUFACTURING

The chart above illustrates the changing output levels of six major non-durable goods manufacturing industries currently concentrated in Ohio. Five of the six contrast with most durable goods industries in that their contractions in the Great Recession were less severe and their recoveries less dramatic. (Spiking output from petroleum and coal products (324, brown triangles) is the big exception.) This reflects the relatively steady demand for non-durables, which generally are expected to last less than three years. However, among the five, output from four major industries remains below pre-recession levels: food and beverages (NAICS 311 plus 312, green diamonds), plastic and rubber products (326, black stars), paper products (322, white squares) and printing (323, black-and-white rectangles). Output from the chemicals industry (325) returned to pre-recession levels, but not before showing some volatility when production dipped in 2013.

Sometimes these patterns of changes in Ohio are similar to corresponding national level changes: national food-beverage-and-tobacco production fluctuated at levels below the 2009 peak;[7] paper products output and printing and related activities have fluctuated at levels lower than pre-recession levels; and plastic and rubber products output fell in the recession, recovering to pre-recession output only in the latest year. As in Ohio, U.S. output of coal and petroleum products also has fluctuated wildly, peaking in 2009 and 2015, but unlike Ohio was lower in 2017 than in 2007. On the other hand, national chemical production has trended lower over the last decade.

ASM and CBP data specify which groups drive their encompassing major industry concentrations here:

- The plastic and rubber products groups (3261 and 3262, both ranked first nationally);
- Processing and preserving fruits and vegetables (3114), Dairy (3115) and other food products (3119 – snacks, coffees, teas, flavorings, seasonings, dressings, etc.); ASM and CBP disagree about bakeries… (3118);
- Products made from purchased paper or paperboard (3222) including coated and laminated items;
- All chemicals groups except pharmaceuticals (3256) and possibly basic chemicals (3251 – ASM and CBP disagree) (U.S. Bureau of the Census, 2018, 2019b).

In addition, CBP data show both printing industry sub-groups are concentrated in Ohio – actual printing on materials (32311) and pre-press and post-press activities (32312); products such as asphalt (32412), lubricants, greases, petroleum jelly, coke, etc. (32419) are concentrated here as opposed to refineries (32411), which are sparse.

The combined output of the six major industries constituted 98.9 percent of all non-durable goods production in Ohio in 2017. Given specific 2018 figures are unavailable, the essentially unchanged (from 2017) summary figure for 2018 probably indicates small and mixed changes for most of the six in 2018.

See Tables A3, A5, A15-A17, A19, A21

OTHER MAJOR MANUFACTURING INDUSTRIES

The chart above illustrates the changing output levels of three durable goods and two non-durable goods industries not concentrated in Ohio. Only one – miscellaneous products (NAICS 339, black-and-white rectangles) – escaped the recession's impact, and only one – computer and electronic products (334, blue squares) – saw moderate, 10.3 percent net growth over the decade. The third – wood products (321, gold circles) recovered from the recession, but had little net change over the decade. The fourth and fifth – textiles and apparel, etc. (313-316, triangles and diamonds) gradually contracted.

The experiences of four industries here are similar to and part of corresponding national-level changes: miscellaneous products escaped the recession's impact, but saw slower than average growth; wood products recovered from the recession, but fluctuated thereafter; and textiles and apparel, etc. continued gradually contracting. These contrast with the national experience of computer and electronic products; its 80.2 percent growth was uninterrupted by the recession.[8]

Annual Survey of Manufactures (ASM) and County Business Patterns (CBP) data show few exceptions to the overall sparse presence of these major industries in Ohio: manufacturing other-leather-and-allied products (3169) like billfolds, shoe components, collars, leashes, harnesses, watchbands, luggage, purses, welders' jackets, etc. is concentrated here; other miscellaneous manufactures (3399 – jewelry, sporting goods, toys, games, office supplies, signs, etc.) appear at least mildly concentrated here; and navigational-measuring-medical-control instruments (3345) employment is close to proportional, (U.S. Bureau of the Census, 2018, 2019b).

See Tables A3-A5, A15-A17, A19, A21

NATURAL RESOURCES AND RELATED INDUSTRIES

The chart above illustrates the varied recent histories of major natural resource and related industries in Ohio. The most obvious change has been the 1,397.4 percent increase in oil and gas production (NAICS 211, brown crosses) from 2007 to 2017.[9] ODNR (2019) production data confirm the tremendous increases:

- total oil production rose 300.9 percent from 4.99 million barrels in 2007 to 20.02 million in 2017;
- total natural gas production rose 2,214.2 percent from 76.5 billion cubic feet in 2007 to 1,769.9 billion in 2017.

These increases are due to the development of the Marcellus and Utica shale deposits in Eastern Ohio beginning in 2011. Oil and natural gas extraction from these two formations comprised 82.6 and 97.5 percent by volume, respectively, of all production for 2017 in Ohio (ODNR, 2019), and vaulted the state to its 4th-rank with 4.8 percent of U.S. industry GDP even as U.S. industry GDP increased 101.9 percent. Despite production growth, County Business Patterns (CBP) data show industry employment (21112-3 and 213111-2) is sparse in Ohio (U.S. Bureau of the Census, 2019b).

Other mining production in Ohio (212, black stars and – here – principally from coal mines and quarries) fluctuated over the years but declined in the latest two for a 21.7 percent net decline in the decade. Corresponding U.S. industry production has trended lower with output 22.6 percent below that of 2007. Other mining output from Ohio remains sparse at 1.73 percent of U.S. industry GDP. While CBP employment data indicate coal mining (2121) is proportional with the U.S. industry, related support jobs (213113) are sparse; actual coal production from Ohio during 2017 was only 1.23 percent of the U.S. total (U.S. Bureau of the Census, 2019b; U.S. EIA, 2019).

The 2018 sector (21) estimates for Ohio and the U.S. are 4.7 and 1.5 percent increases, respectively, from 2017, meaning production may have become slightly more concentrated here. This is almost certainly driven by production from shale deposits. ODNR (2019) data show 2018 shale gas production up 36.5 percent and shale oil production up 19.7 percent from 2017. (Total figures for 2018 are unavailable at this time; however, shale was the source of 82.6 percent of total oil production and 97.5 percent of total gas production in Ohio in 2017.)

Farm production (NAICS 111-2, green squares) fluctuated from year to year, while output from the much smaller forestry-fishing-hunting cluster (113-5, green triangles) has risen, notably in the last six years. These patterns are the opposite of their national counterparts. CBP data show all eight farm-support and forestry-fishing-hunting-etc. groups (1131-1153) are more or less sparse in Ohio. However, data from the U.S. DA (2019) indicate two exceptions in farming: Ohio was the 6th- and 8th-ranked source for soybean and corn production with 6.4 and 4.3 percent, respectively, of U.S. totals in 2018. Initial sector (11) estimates for 2018 show slight contractions in Ohio and U.S. output.

See Tables A1, A3, A6, A15-A17, A21

INFRASTRUCTURE

The chart above illustrates changing output levels from the two parts of the infrastructure cluster: building it (construction, NAICS 23) and supplying what is necessary to keep equipment, homes and other facilities operating (utilities, 22). (No more-specific industry data are available for either sector.) Construction activity in Ohio (gray squares) declined 21.6 percent from 2007 to 2010 but recovered to approximately the 2007 level by 2017. The decline incorporated (but was not limited to) the fall in residential construction and related specialty trades (2361 and 238) due to the financial crisis and the Great Recession. It is consistent with the 49.4 percent drop in building permits issued for residential construction from 2007 through 2010; building permits have since risen 76.7 percent, but still remain 10.6 percent below the 2007 level (U.S. Bureau of the Census, n.d.).[10] A similar trend in construction activity was seen for the nation as a whole: GDP falling 27.7 percent from 2007 through 2011 and growing 19.2 percent from 2011 through 2018. However, data in Appendix Table A3 show 2018 activity levels in Ohio are 30.2 percent lower than in 1998, with U.S. levels 11.2 percent less. Similarly, the numbers of building permits issued also remain below their peaks of more than a decade earlier. While overall construction activity in Ohio is relatively sparse, County Business Patterns (CBP) data point to non-residential building construction (2362) as close to proportional with the nation (U.S. Bureau of the Census, 2019b).

The chart above also illustrates relatively small fluctuations in the otherwise steady provision of utility services *by private sector* organizations (orange diamonds). As judged by CBP employment numbers, these are: principally generating and distributing electric power; secondarily the local distribution of natural gas; and supplying water and treating sewage as tertiary endeavors. (Utility services provided by governments are included in the government sector.) The net change in Ohio was an increase of 10.8 percent from 2007 to 2018. However, data in Appendix Table A3 show 2018 service levels are virtually unchanged from 1998. This 20-year history for Ohio contrasts with the 26.6 percent growth for the nation. This contrast is consistent with the very slow population growth in Ohio and the more rapid U.S. population growth. CBP data point to nearly proportional activity in electric power generation, transmission and distribution (2211) and concentration in local natural gas distribution (2212), while private sector water and sewage services (2213) are relatively sparse in Ohio (U.S. Bureau of the Census, 2019b).

See Tables A3, A14-A17, A21

TRANSPORTATION AND WAREHOUSING – MOVING AND STORING FREIGHT

Private sector transportation and warehousing services move people and goods in large numbers.[11] The more-logistical industries in the sector principally move and store raw and intermediate materials as well as finished goods. The chart above shows the plurality of such services in Ohio are provided by the trucking industry (NAICS 484, orange squares), followed by combination of courier, support and sightseeing services (492, 488 and 487, brown squares).[12] Railroads (482, charcoal rectangles) were the third-ranked source until 2015, when they were surpassed by pipeline services (486, white dots) – the latter grew in response to the tremendous increases in oil and gas production. Water transportation services provided by freighters and barges (483, blue triangles) had the smallest market share.[13]

Trucking services clearly show the effects of the recession and subsequent recovery, following the pattern seen in durable goods production. The same may be said, to a lesser extent, of storage and warehouse (493, dark red diamonds) operations and even rail transportation. These contrast with pipeline and water transportation services, which appear to have been unaffected by the recession. The decline in courier and support services, which fell in the recession without any significant recovery, probably is due at least in part to DHL Express terminating a major operation at Wilmington Air Park in 2009 (Wikipedia, 2019).[14]

These patterns of change here are more or less part of national level changes: (1) the contraction and partial recovery in trucking, (2) the decline and weaker recovery in courier and support services, (3) the relatively steady states of railroad and water transportation, (4) the more or less steady growth in warehousing and storage, and (5) the net growth in pipeline transportation. Ohio's growth rate was comparatively slower in the fourth item and faster in the fifth.

County Business Patterns (CBP) data specify generalized trucking (4841) as concentrated in Ohio. Generalized trucking moves a wide variety of commodities, often those that can be placed on pallets or in containers. Specialized trucking (4842), which uses tankers, refrigerated trailers or specialized equipment for moving household and specific industrial goods, is proportional. CBP data also point to a moderate concentration in couriers (4921) instead of local messenger and delivery services (4922). Similarly, CBP data specify the overall concentration in warehousing and storage services to general and other warehousing and storage (49311 and 49319) as opposed to refrigerated and farm produce storage (49312-3). To a large extent, this is consistent with the general concentration of manufacturing here. Employment in pipeline transportation is concentrated in moving crude oil and refined petroleum products (4861 and 4869) but not natural gas (4862). Rail and other transportation support (4882 and 4889) also are concentrated here (U.S. Bureau of the Census, 2019b).[15]

See Tables A3, A7, A17-A17, A21

TRANSPORTATION – PASSENGER SERVICES

The chart above illustrates the BEA's presentation of the more passenger-oriented transportation services in Ohio:

- airlines (NAICS 481, black stars), which move more passengers than freight,[16] and
- passenger ground transportation services such as taxis, limousines, commuter rail, and local and intercity bus systems (485, blue rectangles).

The chart shows the airline services fell as part of the recession, with sustained recovery first evident in 2013; however, activity in Ohio even in 2017 still remained below the pre-recession peak while service across the nation quickly recovered and expanded at a higher-than-average rate. The smaller passenger ground transportation industry has trended higher since 2010, and changes in Ohio appear to be part of the nationwide expansion.

Neither of these major transportation services is concentrated in Ohio, but County Business Patterns data point to one exception: non-scheduled air transportation (4812) (U.S. Bureau of the Census, 2019b). Non-scheduled air transportation is the flexible part of the system that will go anywhere at any time regularly scheduled planes do not.

Initial 2018 summary data for the sector (48-49p) show continuing growth from 2017 in Ohio and for the nation as a whole (U.S. BEA, 2019).

See Tables A3, A7, A15-A17, A21

INFORMATION

The chart above illustrates the net growth of all four major industries and clusters in this sector over the decade. The sector's net expansion of 38.2 percent was driven principally by the 176.2 percent increase in data processing, hosting and other information services – including Internet publishing (NAICS 518 plus 519, green rectangles), and secondarily by the 42.5 percent growth in the much smaller motion picture and sound recording industry (512, yellow dots). The broadcasting and telecommunications cluster (515 plus 517, blue triangles) expanded by 32.3 percent. It must be noted, though, that the striking expansion and contraction from 2007 to 2014 may be more apparent than real. It may be more the outcome of methodological changes by the BEA dealing with the allocation of earned income by state than a measure of where economic activity occurred.[17] The publishing industry (511, black and white squares), which includes software (5112) as well as print media (5111), grew 7.9 percent.

Three of the four industries and clusters in this sector grew more rapidly in Ohio than the nation's overall rate of 15.5 percent. Yet the only one to expand here at a faster rate than its national counterpart was motion picture and sound recording: 42.5 vs. 29.4 percent.

Overall, the four industries and clusters are more or less sparse in Ohio despite their mostly rapid growth. The only exception is the concentrated employment by print media according to County Business Patterns (U.S. Bureau of the Census, 2019b).

Initial figures for the sector (51) show a slight expansion from 2017 to 2018 here and a higher rate for the nation as a whole (U.S. BEA, 2019).

See Tables A3, A8, A15-A17, A21

FINANCIAL, REAL ESTATE, RENTAL AND LEASING ACTIVITIES

The chart above illustrates the vastly different scales as well as changes over the decade in various financial, real estate and rental and leasing activities in Ohio. GDP numbers for real estate (NAICS 531, white squares), the largest major industry in both the nation and Ohio, are much more indicative of the role mortgages play the economy than of real estate office activities.[18] The growth first evident in 2010 may indicate the start of the housing market's recovery after the Great Recession of 2008 and 2009, and the peak in 2013 may mark the culmination of pent-up demand and a return to normal times. (After falling for years, the number of housing unit building permits also began to rise in 2010 (U.S. Bureau of the Census, n.d.).) Rental and leasing activities (532 plus 533, white dots), a smaller cluster not limited to housing units, fluctuated. The corresponding U.S. industries also began their recoveries about the same times but have sustained growth.

Despite their combined size, both industries are relatively sparse in Ohio. However, County Business Patterns (CBP) data suggest Ohioans' tendency to lease or rent motor vehicles and other consumer goods (5311, 5321-3) is essentially proportional with the nation (U.S. Bureau of the Census, 2019b).

The high 2008-2009 numbers for the banking cluster (521 plus 522, green rectangles) may be more indicative of activity in dealing with the Great Recession than would be the case in normal times. The gradual trend toward to lower numbers since then may reflect decreasing activity related to problematic mortgages as the economy recovered in addition to the unusually low interest rates that persist. Credit intermediation activities nationwide have trended higher, although at a rate slower than the overall economy. These flat and slower rates combined with the jump in insurance industry activity (524, blue rectangles) in 2015 led to a switch in relative positions of the two: insurance has become the second largest industry in this supercluster here and nationwide while banking slipped to third.

Security and investment establishments (523, gold diamonds) saw reduced activity in 2007 and 2008 before investors returned to financial markets in 2009. Activity has moderated in recent years here and across the nation. This contrasts with the net decline over the decade of the tiny funds-and-trusts industry (525, purple triangles) here and nationwide.

CBP data point primarily to insurance carriers (5241, companies actually writing the policies and assuming the risks) – and secondarily to depository credit intermediation (5221, banks, savings-and-loans, credit unions, etc.) as the groups driving sector (52) concentration here; the Federal Reserve also plays a small role (U.S. Bureau of the Census, 2019b).[19]

Initial figures for 2018 show growth in real estate, rental and leasing (53) and contraction in the financial sector (52) both here and across the nation (U.S. BEA, 2019).

See Tables A3, A9, A15-A17, A21

PROFESSIONAL AND BUSINESS SERVICES

The chart above illustrates the changing levels of service provided by six industries from three sectors principally serving businesses. At one end, legal services (NAICS 5411, long black and white rectangles) contracted a net 21.2 percent over the decade. This contrasts with the nearly uninterrupted 71.0 percent growth in computer systems design and related services (5415, short blue rectangles). The remaining professional, scientific and technical services (PST) (5412-4 and 5416-9, gold squares) also grew 16.0 percent, with the only notable decline in 2009. These trends were part of similar national trends. County Business Patterns (CBP) data indicate that none of the PST services is concentrated here – with the mild exception of Other PST services (5419) such as marketing research, opinion polling, translating, photographic and veterinary services (U.S. Bureau of the Census, 2019b).

Enterprise management (55, purple diamonds) consists of almost entirely of headquarters, regional or subsidiary management offices, and lastly of holding companies. These types of establishments are concentrated in Ohio. This is consistent with the 55 Fortune U.S.-1,000 companies headquartered here; seven of the 55 also are on Fortune's Global 500 list, ranking Ohio 5th in the nation in both cases (Fortune, 2019). The chart above shows services contracting to the recession's 2009 nadir and subsequently surpassing the pre-recession peak; the same is true for the industry nationwide. CBP data show corporate and subsidiary *managing* offices and *non*-bank holding companies (551114-3) are concentrated here (U.S. Bureau of the Census, 2019b).[20]

Administrative support establishments (561, orange triangles) specialize in providing out-sourced services to businesses. Activities include document preparation, mailing, bookkeeping, collections and repossessions, as well as the functions of call centers, personnel, security, janitorial and clerical staff – among others. The chart above shows that such services moving largely in-step with enterprise management. This growth pattern also mirrors the national trend. While this major industry has a proportional role in Ohio's economy, CBP data point to other support services (5619) such as repossession, court reporting, stenography, barcoding, inventory, lumber grading, fundraising, etc. as concentrated here (U.S. Bureau of the Census, 2019b). *Private sector* waste management and remediation services (562, green dots) include collecting, treating, incinerating or otherwise disposing of waste materials (except sewage, which is classified as a utility service). Also included are operating landfills and recovering recyclables. These services have grown here and across the nation over the decade. This major industry's concentration here is focused on waste treatment and disposal (5622) (U.S. Bureau of the Census, 2019b).

Initial estimates show at least some expansion of services from 2017 to 2018 in all three sectors here and for the nation as a whole (U.S. BEA, 2019).

See Tables A3, A10, A15-A17, A21

HEALTH CARE AND SOCIAL ASSISTANCE

The chart above documents the recent history of the major *private sector* health care and social assistance industries. Health care services at ambulatory establishments (NAICS 621, green rectangles) and hospitals (622, blue diamonds) rose 30.6 and 18.1 percent, respectively, even after adjusting for inflation. These contrast with the 4.8 percent decline in services provided by nursing and residential care facilities (623, light gray squares). None of these three industries was really phased by the recession even as their growth rates were less than corresponding national trends. Hospitals and nursing/residential care facilities are concentrated in Ohio while ambulatory health care is essentially proportional. County Business Patterns (CBP) data point to general hospitals (6221) and nursing homes/hospices (6231), residential mental retardation, mental health and substance abuse (6232) and community care facilities for the elderly (6233 – which lack nursing care) as the service groups at least mildly concentrated here (U.S. Bureau of the Census, 2019b). Underlying the concentration of nursing homes here are their uses as residences for stabilized mental patients who have nowhere else to go, and as temporary locations for post-surgical rehabilitation. Nursing homes have aggressively pursued the latter because they see Medicare as a generous source of reimbursement, while the concentration of home health care services (6216) may reflect Ohio's emphasis on their use as an alternative to nursing home care (Sutherly, 2013).

The smaller *private sector* social assistance industry (624, gold dots) expanded 11.9 percent and, like health care services, was not really phased by the recession. The expansion here was part of an encompassing national trend. Overall, the industry's role in Ohio's economy is close to proportional with the nation's, with a notable concentration in vocational rehabilitation services (6243) such as job counseling, training and/or work experience for those lacking such; sheltered workshops are included (U.S. Bureau of the Census, 2019b).

Initial figures show continued sector growth from 2017 to 2018 and for the nation as a whole (U.S. BEA, 2019).

See Tables A3, A11, A15-A17, A21

LEISURE AND HOSPITALITY

A careful look at the chart above shows the varying effect of the 2008-2009 recession on three of the four major industries in this cluster. During hard times, people reduce discretionary expenditures such as:

- travel, which means less use of accommodations (NAICS 721, white rectangles);
- going out, which means less patronage of food services and drinking places (722, light gray dots); and
- participation in arts, sports and museums events (711-2, blue squares).

Consequently, such services fell to their lowest levels at the depths of the recession in 2009 and have risen as part of the overall economic recovery and expansion. The same phenomena are evident nationwide. The exception in Ohio was the growth in amusements, gambling and recreation (713, red diamonds) first seen in 2009. Some forms of gambling (7132) were legalized in Ohio in 2009, with casinos opening in 2012. The growth of unregulated Internet or sweepstakes cafes may have played a role in growth from 2007 to 2012 (Ott, 2013). Ironically, amusements-gambling-recreation industry (713) services declined after 2013 while the other industries' services expanded and held steady, equally or surpassing 2007 levels.

Despite legalized gambling's growth in Ohio, County Business Patterns data show it remains sparse here, with only spectator sports (7112), museums (71211), zoos and gardens (71213) and nature parks (71214) concentrated here (U.S. Bureau of the Census, 2019b).

Initial estimates for 2018 show slight increases in arts, entertainment and recreation services (71) here and across the nation, but only virtually no changes accommodation and food services (72) (U.S. BEA, 2019).

See Tables A3, A12, A15-A17, A21

TRADE, EDUCATION AND OTHER PRIVATE SECTOR SERVICES

The chart above illustrates the similarities and differences in the changing activity levels of four sectors. (More specific industry level data are unavailable.) Activity levels in wholesale and retail trade (NAICS 42 and 44-45, green diamonds and gold dots) roughly parallel each other: both fell from their 2007 levels – wholesale by 13.1 percent and retail by 7.2 percent – to their low-points in 2009; both were noticeably expanding by 2013, surpassing their 2007 pre-recession levels in 2015, and continuing to grow into 2018. Other private sector services (81, blue triangles) contracted 14.0 percent from 2007 to 2010 with only gradual expansion since that remains below pre-recession levels. These three patterns in Ohio are quite similar to – and part of – corresponding national sector trends (U.S. BEA, 2019).

These contrast with the slight expansion of *private sector* educational services (61, red squares) from 2007 to 2010 and the subsequent slight contraction to pre-recession levels. (This is consistent with the idea some people enroll in or return to schools to add or improve skills when jobs are scarce, and choose jobs when jobs are more plentiful.) Corresponding services for the nation as a whole also rose during the recession but have fluctuated with no discernible trend as the economy expanded (U.S. BEA, 2019).

Overall activity in wholesale, retail and other private sector services is largely proportional with the nation. However, County Business Patterns (CBP) data point to interesting wholesale sector variations: wholesalers distributing products of *manufacturing* industries concentrated in Ohio tend to have employment concentrated here, perhaps as a carry-over effect. Wholesale jobs more or less concentrated here include those dealing in motor vehicles, parts and tires (4231), metals and minerals (except petroleum) (4235), hardware, plumbing and heating equipment (4237), machinery and equipment (4238), farm product raw materials (4245) and chemicals and plastics (4246). The sparse employment among electrical equipment wholesalers (4236) is an exception to this tendency. CBP data also indicate the varying concentrations of some specific retail and other private sector activities in Ohio: lawn and garden equipment and supplies (4442), florists (4531), used merchandise stores (4533), vending machine operators (4542), commercial equipment repair and maintenance (8113 – excluding motor vehicle and electrical equipment repair), funeral homes, cemeteries and crematories (8122), and civic and social organizations (alumni associations, PTAs, scouts, ethnic associations, social clubs, fraternal lodges, veterans' organizations, etc., 8134) (U.S. Bureau of the Census, 2019b).

While overall private sector educational services here are sparse, CBP data show services by elementary and secondary schools (6111) and junior colleges (6112) are roughly proportional with the U.S. (U.S. Bureau of the Census, 2019b).

See Tables A3, A14-A17, A21

FEDERAL, STATE AND LOCAL GOVERNMENT

Taken together, the services provided by federal, state and local government agencies enterprises are a little sparse in Ohio. However, the graph above illustrates the differences between the three parts of the sector. About 78 percent of all government services in Ohio are provided by state and local agencies (NAICS 92c, white triangles).[21] Those services contracted 3.4 percent over the decade from $49.8 to $48.1 billion, with seemingly little effect by the recession. Concentration ratios at or very close to 1.00 mean that the state and local government services provided here remained in the middle of the range of services provided by all state and local governments in the U.S.

By contrast, the civilian part of the federal government, including the Postal Service (92fc and 491, blue squares), plays a relatively small and sparse role in the state's economy. The military's role (92811, red dots) is even smaller and sparser, despite the presence of facilities such as the Defense Supply Center (Columbus), Wright-Patterson Air Force Base (Dayton), and two Defense Finance and Accounting Service centers (Cleveland and Columbus). The roles of the civilian and military branches of the federal government fluctuated slightly over the decade with no apparent long-term trends. As with state and local spending, the changes seem almost unaffected by the recession. Data from other sources are consistent with the GDP concentration ratios; in 2017:

- 0.16 percent of the labor force (employed and unemployed persons ages 16 years) in Ohio was in the armed forces – less than the national average of 0.62 percent (U.S. Bureau of the Census, 2019a);
- 1.64 percent of all employed civilians ages 16 years and older in Ohio worked for the federal government – less than the national average of 2.39 percent (U.S. Bureau of the Census, 2019a; bases for the percentages include self-employed and unpaid family workers);
- 1.50 percent of the value of Defense Department procurement contracts went to firms in Ohio (U.S. FPDS, 2019).

The initial 2018 summary figures for government services (92) indicate a 0.4 percent contraction from 2017 here, but virtually no change for the nation as a whole (U.S. BEA, 2019).

See Tables A3, A13, A15-A17

SUMMARIZING CHANGES: 2007-2009

The chart above shows that Ohio was hit relatively hard by the 2008-2009 recession; total output fell 5.9 percent from 2007 to 2009. Only five states suffered steeper declines: Arizona, Florida, Indiana, Michigan and Nevada. The table below shows 72.7 percent of Ohio's $32.2 billion output decline was due to the $23.4 billion-37.8 percent drop in durable goods. Although all such major industries saw reduced production, the data in Appendix Table A4 point to the near collapse of the motor vehicle industry in Ohio, a $11.5 billion-76.2 percent plunge in output as the largest contributing factor. As the distress of the financial crisis ricocheted through the economy, consumers (both individuals and organizations) cut way back on postpone-able purchases of big-ticket items in general. (This is one reason why durable goods industries are highly cyclical). Given the concentration of durable goods production in Ohio, it is understandable how and why its economy was hit so hard.[22]

	GDP*		Changes*	
Sector	2007	2009	Numeric	Percent
Total	**$541.1**	**$509.2**	**-$32.2**	**-5.9%**
Private sector	**$477.8**	**$446.3**	**-$31.6**	**-6.6%**
Goods-producing summary	$134.6	$107.9	-$26.7	-19.8%
Agriculture, forestry, fishing & hunting	$3.4	$4.8	$1.4	41.5%
Mining	$3.4	$3.9	$0.5	16.0%
Construction	$19.3	$16.3	-$3.0	-15.7%
Durable goods manufacturing	**$61.9**	**$38.5**	**-$23.4**	**-37.8%**
Non-durable goods manufacturing	$45.1	$45.5	$0.4	1.0%
Service-providing summary	$344.2	$338.3	-$6.0	-1.7%
Utilities	$8.6	$8.8	$0.1	1.4%
Wholesale trade	$36.6	$31.8	-$4.8	-13.1%
Retail trade	$33.9	$31.4	-$2.4	-7.2%
Transportation & warehousing	$17.4	$15.4	-$2.0	-11.7%
Information	$13.9	$16.8	$2.9	21.0%
Finance & insurance	$43.0	$43.7	$0.8	1.8%
Real estate, rental & leasing	$56.3	$56.3	-$0.0	-0.0%
Professional, scientific & technical	$26.6	$27.3	$0.7	2.7%
Management of companies & enterprises	$14.5	$13.7	-$0.8	-5.5%
Administrative support & waste management	$15.8	$14.4	-$1.4	-8.7%
Education	$5.3	$5.9	$0.6	11.6%
Health care & social assistance	$43.5	$46.2	$2.8	6.3%
Arts, entertainment & recreation	$4.6	$4.6	$0.0	0.4%
Accommodation & food services	$12.5	$11.1	-$1.5	-11.6%
Other non-governmental services	$12.8	$11.2	-$1.6	-12.4%
Government	$63.5	$62.9	-$0.6	-0.9%

Notes: * - in billions standardized on 2012; figures may not sum to totals due to rounding; percentages are based on unrounded numbers.

SUMMARIZING CHANGES: 2009-2018

The chart above shows that Ohio's economic recovery, starting from 2009, has been at an above-average rate that exceeded that of 32 states and the District of Columbia. The table below shows an inflation-adjusted 18.1 percent increase of $92.3 billion in the volume of goods produced and services provided in nine years. All of this growth has come from the private sector, which offset the slight drop in government services. The rapid rise has been partially due to the $18.0 and $14.1 billion added by durable goods manufacturing and mining; data in Appendix Tables A4 and A6 point to the motor vehicle industry and oil and gas extraction as the greatest parts of durable goods' and mining's growth.[23] However, it has been the steadier collective growth of private sector services that contributed 66.9 percent of the total net growth with a broadly-based net increase of $61.7 billion. The five largest private service sectors' contributions have been highlighted.

	GDP*		Changes*	
Sector	2009	2018	Numeric	Percent
Total	**$509.2**	**$601.5**	**$92.3**	**18.1%**
Private sector	**$446.3**	**$539.4**	**$93.2**	**20.9%**
Goods-producing summary	**$107.9**	**$139.5**	**$31.6**	**29.3%**
Agriculture, forestry, fishing & hunting	$4.8	$3.6	-$1.2	-25.5%
Mining	**$3.9**	**$18.0**	**$14.1**	**360.6%**
Construction	$16.3	$19.0	$2.8	17.0%
Durable goods manufacturing	**$38.5**	**$56.6**	**$18.0**	**46.8%**
Non-durable goods manufacturing	$45.5	$45.2	-$0.3	-0.7%
Service-providing summary	**$338.3**	**$400.0**	**$61.7**	**18.2%**
Utilities	$8.8	$9.6	$0.8	9.2%
Wholesale trade	**$31.8**	**$40.2**	**$8.4**	**26.3%**
Retail trade	**$31.4**	**$38.6**	**$7.2**	**22.9%**
Transportation & warehousing	$15.4	$18.8	$3.4	22.2%
Information	$16.8	$19.9	$3.1	18.4%
Finance & insurance	$43.7	$46.5	$2.8	6.5%
Real estate, rental & leasing	**$56.3**	**$64.2**	**$7.9**	**14.0%**
Professional, scientific & technical	$27.3	$32.6	$5.3	19.5%
Management of companies & enterprises	**$13.7**	**$21.0**	**$7.4**	**53.7%**
Administrative support & waste management	$14.4	$18.5	$4.1	28.1%
Education	$5.9	$5.3	-$0.6	-10.9%
Health care & social assistance	**$46.2**	**$53.1**	**$6.9**	**14.8%**
Arts, entertainment & recreation	$4.6	$6.8	$2.2	47.5%
Accommodation & food services	$11.1	$13.6	$2.6	23.2%
Other non-governmental services	$11.2	$11.7	$0.5	4.3%
Government	$62.9	$62.2	-$0.7	-1.1%

Notes: * - in billions standardized on 2012; figures may not sum to totals due to rounding; percentages are based on unrounded numbers.

RECESSION AND RECOVERY IN METROPOLITAN AREAS AND COUNTIES

The table above displays changes in economic output for six multi-county metropolitan areas (MAs) wholly in Ohio and two crossing state boundaries, as well as for the state and the nation. Ohio portions of the latter two are also displayed. (One-county MAs – either wholly in Ohio or as part of a cross-state MA – are part of the county tables.) The figures have been adjusted for inflation and standardized on 2012.

The widespread impact of the recession during 2007-2009 is evident with output from all eight contracting at steeper rates than the national average of 2.7 percent; six of the eight contracted at rates steeper than the state average of 5.9 percent. Youngstown-Warren-Boardman was hit the hardest, contracting 11.5 percent overall in two years, with the Ohio portion contracting 13.0 percent. These figures contrast with Cincinnati and Columbus, which contracted 3.9 and 3.7 percent, respectively. One partial explanation may be that Cincinnati and Columbus are relatively less dependent on the highly cyclical steel and motor vehicle industries.

All the multi-county MAs have experienced growth since 2009. Canton-Massillon and Columbus grew at rates greater than the national average of 22.5 percent, while Cincinnati was close to the state average of 18.9 percent. The slower-than-average expansion rates in other MAs may be partially explained by the steel and motor vehicle industries not completely returning to pre-recession output levels due to plant closures, product changes and shifting market preferences. Canton-Massillon is the obvious exception, due in part to the expansion of oil-and-gas extraction in Carroll County.

Changes for all of Ohio's counties – metropolitan and non-metropolitan – are shown in Appendix Table A22.

See Table A22

PAST CHANGES AND FORECASTS FOR THE FUTURE: THREE PARTS

The chart above shows that, after adjusting for inflation, Ohio's absolute output (red squares) grew a net 11.0 percent from 1998 through 2007. The corresponding growth of the U.S. absolute output (blue squares) was 29.8 percent. As mentioned earlier, the chart also shows 2008-2009 recession hit Ohio harder than most of the nation: total output of goods and services here fell 5.9 percent as the index value dropped from 111.0 to 104.4, while national output fell 2.7 percent from 129.8 to 126.3. Revised figures suggest that Ohio's initial recovery rate, from 2009 to 2014, was a bit faster than for the nation as a whole: 12.0 vs. 11.2 percent but has since slowed: 5.5 vs. 9.8 percent. Despite the more-rapid initial growth rate here, absolute output from Ohio remained less than its pre-recession peak until 2013 – two years later than what characterized the nation as a whole.

Absolute numbers do not tell the whole story. A number of factors may explain the seemingly faster recovery of the U.S. economy as compared with Ohio's. One is population growth. Population figures used by the BEA show the U.S. population growing 18.6 percent from 1998 through 2018, a much faster rate than Ohio's 3.3 percent; and the chart on page 168 in the Appendix shows states with faster-growing populations tended to have more rapidly growing economies. For this reason, the chart above also illustrates expansions and contractions after adjusting for population growth. Per capita GDP from Ohio (white dots with red borders) was 9.1 percent greater in 2007 than in 1998, modestly less than the 11.0 percent for the state's absolute output. By comparison, per capita GDP for the nation (white dots with blue borders) rose 18.9 percent during the same time. This is still notably greater than Ohio, but substantially less than the 29.8 percent absolute increase. The population growth adjustment also means the impact of the recession has been deeper than indicated by absolute figures alone. Per capita GDP from Ohio fell 6.2 percent – a fraction more than the 5.9 percent based on absolute output. However, per capita GDP for the nation declined 4.4 percent, notably more than the 2.7 percent for absolute output. Furthermore, the higher national population growth rate means, even with economic expansion evident since 2009, national per capita GDP remained less than its 2007 pre-recession peak until 2013 – the same as Ohio.

The charts on the following two pages put the recession and recovery in a somewhat different light than the corresponding charts on pages 66 and 68. After adjusting for population changes, the chart on page 74 illustrates just how much deeper and more widespread the recession was for all but eight states. Although the contraction was a little deeper in Ohio (6.2 vs. 5.9 percent), the populations of eight states – not just five – were hit harder than Ohio. Conversely, the chart on page 75 shows that Ohio's recovery rate is slightly diminished after adjusting for its small population increase (from 18.1 to 16.5 percent), but it moves up to become the 6th fastest growing state – and at a rate above the national average.

See Table A23

The same per capita GDP approach has been applied to the multi-county metropolitan areas (MAs) in Ohio, yielding further insight into their economic fortunes. The table above displays and summarizes the changes in inflation-adjusted per capita GDP from 2007 through 2018. As with the aggregate figures, the recession was – and the recovery and expansion have been – widespread across Ohio; all the net change figures for the eight MAs were negative during 2007-2009, and all have been positive during 2009-2018. However, several changes stand out:

- During 2007-2009: After adjusting for their population growth, the economic contractions in Cincinnati and Columbus were steeper than the aggregate figures indicated; at least 4.7 vs. 3.9 percent in Cincinnati, and 6.1 vs. 3.7 percent in Columbus; conversely, the contraction in Youngstown-Warren was not quite as steep as aggregate figures indicated; 11.8 vs. 13.0 percent in the Ohio portion; this was due to population decline. Figures for other MAs were little changed from the aggregate changes because their populations were little changed.
- During 2009-2018: After adjusting for their population growth, the expansions in Cincinnati and Columbus were at slower rates than the aggregate figures indicate – less than 14.5 vs. greater than 18.0 percent in Cincinnati, and 12.9 percent vs. 26.0 percent in Columbus; conversely, the growth rates in Youngstown-Warren and Toledo have been greater than aggregate figures would leave one to believe – a 11.1 vs. 5.4 percent (for the Ohio portion) and 15.7 vs. 14.2 percent, respectively, after adjusting for population decreases.
- Over the 12 years: Canton-Massillon stands out as the most rapidly growing economy at 25.9 percent, the only one in Ohio above the state and national averages, notably due to the recovery of the iron and steel industry in Stark County as well as the expansion of oil-and-gas extraction in Carroll County – among other factors; this contrasts with Youngstown-Warren, where per capita GDP in 2018 remained 2.0 percent below output from 2007.

Despite the various changes, it should be noted that Cincinnati, Cleveland and Columbus maintained per capita GDP output levels usually exceeding $50,000 per year – greater than the state average and, for Cincinnati, greater than the national average. These three remained the principal powerhouses of Ohio's economy even after adjusting for their much larger populations. Among the smaller MAs, only Toledo rivaled the big three on a per capita basis.

A second factor associated with the different economic growth rates of Ohio and the U.S. may be differences in the composition of their economies. Appendix Table A22 shows that various industries grew at rates faster or slower than the national average of 56.7 percent for 1997-2017; some industries even contracted during that time. It also shows the industries concentrated in Ohio in varying degrees as well as those that are relatively sparse. The industries can be grouped by those characteristics, and the portions of the Ohio and U.S. economy may be calculated for each of the four groups:

(1) those growing faster than the overall national growth rate and concentrated-in-Ohio,
(2) slower-growing/contracting and concentrated here,
(3) faster-growing but sparse in Ohio, and
(4) slower-growing/contracting and sparse here.

The chart above illustrates the relative portions of the four groups for the U.S. and Ohio economies in 1997 as represented by the blue and white areas, respectively. Overall, 43.9 percent of Ohio's economic output in 1997 was in industries characterized by faster-than-average national growth rates for the then-coming 18 years. (See the white areas on the right side; 18.5 + 25.4 = 43.9.) This compares with 48.2 percent for the U.S. (See the blue areas on the right side; 14.7 + 33.5 = 48.2.) Conversely, 56.2 percent of Ohio's economic output in 1997 was in industries that would be characterized by slower-than-average or negative growth rates, compared with 51.9 percent of the U.S. (These are sums of the white and blue areas on the left side.)

Specific comparisons are even more telling. In 1997, 18.5 percent of Ohio's output was from rapid-growth industries concentrated here compared with only 14.7 percent of U.S. output, a difference of 3.8 percent favoring more rapid growth in Ohio. However, this was more than offset by the relative scarcity of *other* rapid-growth industries in Ohio: 25.4 vs. 33.5 percent, a deficit of 8.1 for the state. Furthermore, 33.0 percent Ohio's output that year came from slow-growth or contracting industries concentrated here vs. only 23.2 percent of total U.S. output, a 9.8 percent difference more than offsetting the state's advantage in *other* such industries *not* concentrated here – 23.2 vs. 28.2, or 5.0 percent. All of these contrasts point to the conclusion that – regardless of different population growth rates – Ohio's mix of industries in 1997 predisposed it toward slower economic growth through 2017.

See Table A24

The differing mix of industries between Ohio and the nation is matter of degree and should not be over-emphasized. The chart above illustrates the association between changes in industry output – both growth and decline – in Ohio with corresponding changes at the national level for 1997-2017. The dots collectively cover at least 94.0 percent of each economy.[24] It is evident faster-growing industries in one were, much more often than not, more or less faster-growing industries in the other; the same may be said for slower-growing or contracting industries.[25] Consequently, national forecasts for industries and the economy are quite often fairly reliable guides for what to expect in Ohio over the long term.[26]

The U.S. BLS (2018) predicts national gross duplicated output (i.e., GDP plus the value of intermediate goods and services) will grow at an average annual rate of 2.1 percent during the 2016-2026 decade. (See the table on the following page.) The private sector is expected to grow faster than government services: 2.2 vs. 0.9 percent. Within the private sector, the service providers collectively are expected to grow faster the goods producers: 2.4 vs. 2.0 percent. However, this is not true of every sector within the two super clusters. The fastest growing sectors are forecast to be, in descending order: health care/social assistance, information and mining (tied) and construction. Other sectors predicted to expand faster than average are wholesale and retail trade, finance/insurance, real estate/rental/leasing, professional/scientific/technical services and administrative-support/waste-management. The prevailing faster-growing service sectors mean that the *distribution* of economic activity is expected to continue the long-term shift away from goods production.

The concentration or sparsity in Ohio of sectors with different growth rates has mixed implications for the state's potential growth in this decade. On one hand, the concentration of sectors forecast to grow faster than average – healthcare/social-assistance, finance/insurance, and now mining – may drive economic growth. Conversely, the sparsity of predicted slower-growth sectors – accommodation/food services, agriculture-forestry-fishing-hunting and education – are an absence of restraint. On the other hand, the concentration of slower-growth sectors – manufacturing and utilities – as well as the sparsity of more-rapid growth sectors – construction, information and professional/scientific/technical services – bode less rapid growth. Remaining sectors are roughly proportional with the nation and may following accordingly, but it is the projected slower population growth rate for Ohio (compare Office of Research of Research, 2018, with U.S. Bureau of the Census, 2014b), due to persistent (if not constant) domestic out-migration, that may be the most significant factor pointing to a slower overall long-term economic growth rate when compared with the nation as a whole (Moody's, 2018).

Real economic growth is associated with employment growth. Figures in the table on the following page show longer-term U.S. overall economic growth averaging 2.1 percent per year with the corresponding employment growth averaging 0.1 percent. However, there are exceptions. The U.S. BLS (2018) predicts greater volumes of manufactured and agricultural-forestry-fishing-hunting goods will be produced in America in the future, but the number of jobs in these sectors is expected to decrease or remain largely unchanged. (In any case, though, real economic growth above and beyond employment growth is due in part to increased productivity.)[27]

Forecasted U.S. Economic Annual Growth Rates, 2016-26, and Projected Job Changes in Ohio, 2016-2026

NAICS Codes	Industry Titles	Forecast U.S. Annual Growth Rates 2016-26: Gross Duplicated Output[1]	Forecast U.S. Annual Growth Rates 2016-26: Jobs[1]	Projected Job Changes in Ohio 2016-26[2]: Annual Growth Rate	Projected Job Changes in Ohio 2016-26[2]: Total	Job Rates: U.S. minus Ohio
11-92	Total	2.1%	0.7%	0.4%	253,330	0.3%
11-81	Private industry employment	2.2%	0.8%	0.4%	234,190	0.4%
11, 21, 23, 31-33	Private goods-producing employment	2.0%	0.1%	-0.2%	-19,220	0.3%
11	Agriculture, forestry, fishing & hunting	1.4%	0.0%	-0.9%	-840	0.9%
21	Mining	2.9%	1.4%	0.6%	660	0.8%
23	Construction	2.7%	1.2%	1.0%	21,470	0.2%
31-33	Manufacturing	1.8%	-0.6%	-0.6%	-40,510	0.0%
32p & 33	Durable goods	1.9%	-0.5%	-0.5%	-23,890	0.0%
31 & 32p	Nondurable goods	1.7%	-0.7%	-0.8%	-16,620	0.1%
22, 42-81	Private service-providing employment	2.4%	0.9%	0.6%	253,400	0.3%
22	Utilities	1.4%	0.1%	-0.1%	-170	0.2%
42	Wholesale trade	2.6%	0.2%	0.0%	830	0.2%
44-45	Retail trade	2.5%	0.3%	0.2%	10,090	0.1%
48-49p	Transportation & warehousing[3]	2.1%	0.7%	0.6%	12,210	0.1%
51	Information	2.9%	0.2%	-0.8%	-5,320	1.0%
52	Finance & insurance	2.4%	0.6%	0.6%	14,070	0.0%
53	Real estate, rental & leasing	2.4%	0.6%	0.6%	3,770	0.0%
54	Professional, scientific & technical services	2.3%	1.3%	0.4%	9,550	0.9%
55	Management of companies & enterprises	2.2%	0.6%	1.0%	14,080	-0.4%
56	Administrative support & waste management	2.3%	0.9%	0.8%	25,790	0.1%
61	Educational services	1.3%	1.3%	0.6%	24,910	0.7%
62	Health care & social assistance	3.1%	1.9%	1.5%	135,630	0.4%
71	Arts, entertainment & recreation	2.2%	0.9%	0.6%	4,920	0.3%
72	Accommodation & food services	1.6%	0.8%	0.0%	-180	0.8%
81	Other services, exc. government	1.4%	0.5%	0.1%	3,220	0.4%
n.a.	Nonagricultural self-employed, etc.[4]	1.0%	0.9%	0.7%	19,830	0.2%
92, 491	Government (inc. U.S. Postal Service)	0.9%	0.3%	-0.0%	-680	0.3%

Notes: 1 - gross duplicated output (GDO) includes all new goods and services produced as intermediate goods for further use in production as well as the GDP (the final demand purchased of new goods and services); forecasted GDO growth rates have been adjusted for inflation; some GDO and jobs figures are derived from the U.S. BLS (2018); 2 - some components may not sum to totals due to rounding; 3 – except the U.S. Postal Service; 4 - nonagricultural self-employed and unpaid family workers may be in any non-agricultural private sector industry, but are not included sector-specific figures above; the exception is agriculture, etc., which includes self-employed and unpaid family workers. Abbreviations: exc. – except; inc. – including; p - part. Sources: ODJFS/LMI (2018) and U.S. BLS (2018).

The latest projections by the Ohio Dept. of Job and Family Services Labor Market Information division (ODJFS/LMI, 2018) predict 253,300 jobs may be added in Ohio from 2016 through 2026, an annual average growth rate of about 0.4 percent per year. The 234,190 employees added from the private sector offset the 680 which may be lost from the government sector. In turn, expected growth in private sector self-employed-and-unpaid-family-workers plus private service-providing employees (19,830 + 253,400) offsets the forecast net loss of 19,220 jobs among goods-producing employees. Within the two private-sector super clusters, 12 service-providing sectors are expected to gain jobs – led by health care and social assistance; among goods-producers possible gains in construction may partially offset predicted losses in manufacturing and agriculture.[28] However, comparisons with corresponding BLS projections suggest employment growth in Ohio may be equal to or less than the comparable national rate, except for enterprise management.

Long-term projections are made with little or no consideration of business cycles. On the other hand, near-term forecasts try to anticipate continuations of or changes in current economic trends. Moody's (2018) predicted Ohio's economy would grow 1.3 percent in 2019 and 0.1 percent in 2020 – forecasts consistent with its "late expansion" characterization of the state's current business cycle status. Such economic growth would support ODJFS/LMI's (2019) most recent Ohio Leading Indicators report, which expects employment growth *during the next six months* at an annualized rate of 1.11 percent. This is based on several indicators using the latest 12 months of data: the rise in housing permit values in Ohio combined with the near steady state of other indicators – its total nonfarm employment, manufacturing hours and initial claims for unemployment insurance plus the steady state of U.S. leading indicators and manufacturing output.[29]

The "late expansion" description can be interpreted as both continued-but-slower economic growth and a recession are possible in the not-too-distant future. On one hand, a tight labor market and strong consumer spending are expected to maintain the economy (excepting U.S. manufacturing) despite possible negative impacts of national and international decisions and changes on the U.S. economy (Rugaber et al., 2019). In that same vein, a recent survey of economists also found consumer spending remains strong; yet that same survey found about 75 percent of economists expect a recession in 2020 or 2021. This pessimism reflected "growing skepticism among economists and investors that the U.S. economy will be able to withstand a protracted trade war with China without serious harm amid the weakening global outlook" that includes nine other major economies either in recession or on the verge of one (Marte, 2019). What's different from previous doubts that tariffs alone would be sufficient to cause a recession (see Irwin, 2018) is their expansion to cover household goods from China. Depending on how many items are covered at what rate, costs for the average American household could increase by $1,000 to $1,500 per year – big enough to erase the 2017 income tax cut benefit (Telford, 2019).

The recent trade deal with China may ease only some of those concerns. On one hand, China agreed to open some markets and increase purchases from the U.S. by $200 billion, including farm and energy products, as well as reduce

some tariffs it imposed on U.S. goods. This may eventually benefit Ohio farmers and others. (China had fallen from the second largest market for Ohio farm products to fifth and is not currently purchasing Ohio soybeans). On the other hand, the deal does little to address China's subsidies and support for key industries competing with U.S. businesses – notably steel and solar energy. While the U.S. will ease some tariffs in return, the bulk of the $360 billion remain in place, and there is deep skepticism another trade deal will soon be reached (Swanson and Rappeport, 2020).

Tariffs are intended to protect domestic industries by increasing prices paid by domestic consumers of the similar foreign-sourced goods, thereby insuring domestic demand. However, tariff costs often are passed along to consumers because companies do not want to "eat" the costs (see Torry, 2018). Not only are consumers ultimately paying the tax, prices of products incorporating those goods must rise to cover the added cost. Furthermore, higher prices for American-made goods tend to reduce U.S. exports. (Reduced exports also mean reduced shipping activity by whatever mode would have been used.) In addition to increasing prices paid by businesses and households here, trading partners may retaliate in kind (Dendrinou and Weber, 2018; Nebehay, 2018) or by targeting other products (Bradshaw and Li, 2018) with their own tariffs – such as China did with soybeans, a prominent crop in Ohio (Malone, 2018; Torry, 2018). Telford (2019) notes farmers are received subsidies to offset the impact, but new U.S. tariffs on more Chinese goods are likely to prompt additional retaliation on more goods and services (McDonald, 2019).[30]

Writers cite additional factors besides the U.S.-China schism pausing or reducing consumer and business spending and leading to a recession: the waning effects of the 2017 income tax cut, occasionally inverted yield curves (an indicator of investors' doubts about the economy's strength and often a harbinger of recessions), the economic fallout of geo-political uncertainties in an interconnected world such as how China deals with Hong Kong, Britain's exit from the European Union, and conflict between India and Pakistan (Choe and Veiga, 2019; Irwin, 2019; Marte, 2019; Rugaber et al., 2019).

Beyond these analytical takes, data are appearing that may concern some analysts. For example:

- the U.S. Industrial Production Index, which measures output from the mining, manufacturing and utilities sectors, essentially has been unchanged since late in 2018 (Board of Governors of the Federal Reserve System, 2020);
- Initial 2019 U.S. light vehicle sales are down 1.2 percent from revised 2018 figures as increasing light truck sales have not offset declining car sales; this is true for both cars and light trucks assembled in and outside of N. America (Automotive News, 2020);
- Production follows sales, and 2019 production figures show initial total light vehicle assemblies in Ohio and N. America were 8.1 and 4.1 percent below their respective (and revised) 2018 levels, with increasing light truck production not offsetting declining car production (Automotive News, 2020);
- December 2019 year-to-date total housing unit permits issued in Ohio are down 1.75 percent from 2018 but up 3.98 percent for the U.S. (U.S. Bureau of the Census, n.d.).

APPENDICES

TERMINOLOGY

The *Gross Domestic Product* (GDP) of Ohio is the final value of goods produced and services provided by capital and labor located in the state. Put another way, a state's total GDP is the sum of the value-added – revenue less the costs of goods and services purchased – for all industries therein. It is actually measured using data such as employees' compensation, taxes on production and imports less subsidies, and gross operating surplus. It is nearly the state equivalent of GDP for the nation, differing from the latter by excluding contributions of overseas federal personnel as well as other methodological considerations. Data are gathered from at least 19 different federal agencies. (Platt and Mead, 2017: 2).

Beginning in 1997, statistics on the nation's industries have been organized under the North American Industrial Classification System (NAICS). Establishments producing goods or providing services sufficiently alike are classified in the same *industry*. A six-digit NAICS code is assigned to each industry. Closely related industries formed an *industry group*. The first four digits of the code indicate the group to which the industries belong. (The first five digits occasionally indicate a sub-group.) Industry groups with common elements and shared characteristics comprise a *major industry* or *sub-sector*. The first three digits of the code indicate a major industry, and the first two digits indicate the *sector* (Office of Management and Budget, 1998, 2007). The U.S. BEA usually publishes GDP-by-state figures down to the major industry level. However, figures are available only at the sector level in some instances, while in a few others, they are available for industry groups or a combination of industry groups within a major industry.

The NAICS uses guidelines that may be new or different from the 1987 Standard Industrial Classification (SIC) system that it replaced. Occasionally, this has meant that establishments classified in the same industry under the SIC system were classified in different industries – even different groups, major industries, and sectors – under the NAICS. Consequently, the change from the SIC system to the NAICS represents an insurmountable discontinuity in charting more or less specific changes in Ohio's economy before 1997. This report is therefore limited to the years beginning with 1997.

DETAILED TABLES

This page intentionally blank

This page intentionally blank

This page intentionally blank

This page intentionally blank

NOTES

1 The ranks of Vietnam and Algeria reflect their much larger populations – 97,040,000 and 41,657,000, respectively – as well as their economic development levels. It also is worth noting the GDP for the 28-nation European Union, “an internal single market with free movement of goods, services, capital, and labor” as well as standard customs for imports, was $20,850 billion, making it the second largest economy in the world and the U.S. third. However, its population is 517,111,000 compared with America’s 329,256,000 (U.S. CIA, 2019). All international GDP figures are based on Purchasing Power Parity (PPP):

> "A nation's GDP at [PPP] exchange rates is the sum value of all goods and services produced in the country valued at prices prevailing in the United States… This is the measure most economists prefer when looking at per-capita welfare and when comparing living conditions or use of resources across countries. The measure is difficult to compute, as a US dollar value has to be assigned to all goods and services in the country regardless of whether these goods and services have a direct equivalent in the United States (for example, the value of an oxcart or non-US military equipment); as a result, PPP estimates for some countries are based on a small and sometimes different set of goods and services. In addition, many countries do not formally participate in the World Bank's PPP project that calculates these measures, so the resulting GDP estimates for these countries may lack precision. For many developing countries, PPP-based GDP measures are multiples of the official exchange rate (OER) measure. The differences between the OER- and PPP-denominated GDP values for most of the wealthy industrialized countries are generally much smaller" (U.S. CIA, 2019).

Another reason PPPs are preferred over OERs is because the latter are subject to international and domestic financial forces not capturing the value of domestic output. University of Pennsylvania Professors Summers and Heston and their colleagues pioneered research in PPP figures. The CIA and OECD websites may have more details.

2 County ranks for sectors may be apparent because figures are not always published for all 88 counties.

3 The choice of start and end points for a period can affect how changes during that time are viewed. What looks like a trend with one set of points for one time-period may appear as a random fluctuation with another set of points for another, overlapping time-period. This is particularly true when the time periods are short. Furthermore, initial figures usually are revised when additional information becomes available later, and interpretations of figures may change as a consequence. (Appelbaum, 2011, has a more detailed discussion.) Caution is warranted.

4 Table A17 and the related graph on page 102 illustrate the very strong association between the percentages of GDP and value-added (VA – essentially the value of shipments minus the costs of labor and materials) coming from Ohio for the 19 major manufacturing industries and clusters used by the BEA. The association is so strong because GDP calculations start with the Census Bureau's VA estimates; they differ a bit because the BEA subtracts additional costs such as purchased services, which may vary by industry. The strength of this association means that the VA percentages calculated *for manufacturing industry groups*, shown in Appendix Table A18, are very good proxies for percentages of GDP. Similarly, and more widely applicable, Appendix Table A19 and the related graph on page 110 show the association between concentration ratios based on the private sector GDP and corresponding County Business Patterns (CBP) employment figures (farms and railroads are excluded from both). The strength of this association means CBP concentration ratios *for industry groups* shown in Appendix Table A20 generally are good proxies for GDP data. VA and CBP data specify our understanding of sectors and major industries concentrated in Ohio, and may point to groups that are exceptions in sectors and major industries not concentrated here. More specific (i.e., 5- and 6-digit) industry data are available from CBP and the quinquennial Census of Manufactures, but space limitations, data suppression and timeliness issues usually preclude their use herein.

5 Honda's large Marysville plant and adjacent, much smaller Performance Manufacturing Center are counted separately. The remaining five light vehicle plants were in Avon Lake, E. Liberty, Lordstown and Toledo. The same Avon Lake plant also assembles medium-duty trucks. Heavy-duty trucks were assembled in Chillicothe, while buses and medium- and heavy-duty trucks were assembled in Springfield.

6 The engines-turbines-power transmission group includes all diesel engines (333618) – even those for motor vehicles – but otherwise excludes motor vehicle parts. It also excludes equipment for transmitting electricity.

7 Comparing food-beverage-tobacco product output in Ohio with the nation is subject to the caveat that the Census Bureau finds no or a vanishingly small level of tobacco product manufacturing in Ohio, depending on the source. This difference should not be exaggerated, though, because tobacco product (3122) value-added and employment figures were 8.8 and 0.8 percent, respectively, of the encompassing U.S. food-beverage-tobacco product (311-2) cluster figures in 2016 (U.S. Census Bureau, 2018, 2018b).

8 46.9 percent of the industry's national growth took place in California and 11.8 percent occurred in Texas, which already were the leading states in 2007. (The industry also contracted in 6 states over the decade.) It is possible industry growth figures incorporate quantitative and qualitative improvements beyond greater output volumes.

9 Examples of support activities include fee or contract-based exploring, drilling, coring, testing and/or making geological observations independently from the companies extracting the material.

10 The rise in construction activity from 1997 through 1999 also is consistent with the rising number of building permits during the same years (U.S. BEA, 2018; U.S. Bureau of the Census, n.d.).

11 The U.S. BEA (2019) groups the U.S. Postal Service (491), which may be seen as a specialized transportation service, with the civilian side of the federal government (92c) in its industry statistics.

12 Sightseeing establishments (487) serve tourists, and therefore are not part of the logistical cluster. However, those services are a tiny fraction of this cluster as judged by employment; the vast majority of employees work either for courier and delivery services (492), which use any transportation mode (but depend heavily on trucks), or support establishments (488). The last include arranging freight transportation, airport operations, air traffic control, crating-packing and cargo-handling, port operations, towing, and navigational, courier and railroad car services, etc. (Office of Management and Budget, 2007).

13 Rail and water transportation services carry some passengers, but the Association of American Railroads (2019) emphasizes moving freight, and CBP data for water transportation show most are employed in moving cargo (U.S. Bureau of the Census, 2018b). Commuter rail and ship-based sightseeing services are classified in 485 and 487 (Office of Management and Budget, 2007).

14 The slight uptick in 2015 through 2017 may be due in part to Amazon's use of the facilities for those years. Amazon shifted its operations to Cincinnati International (CVG) in northern Kentucky in 2017 (Wikipedia, 2019), but has not abandoned work at Wilmington Air Park (Livingston, 2019).

15 Rail services include maintaining and repairing equipment as well as terminal operations. Other transportation support activities include packing and crating, arranging van and carpools, operating independent pipeline terminal facilities, stockyards, etc. (Office of Management and Budget, 2007).

16 CBP data show most people employed in air transportation work in the passenger side of the industry rather than in air freight (U.S. Bureau of the Census, 2018b).

17 Lenze (2016: 4) notes *improved geo-coding* and editing of source data from IRS Form 1065 (partnership returns) and Form 1040 Schedule C (sole proprietor returns). (Thanks to Lam Cao of the BEA for this reference.) This

explains why the pattern differs from the corresponding national pattern of expansion from 2007 to 2008, a trough from 2009 through 2011, followed by expansion to 2017. Employment trends may bolster the argument this is an accounting anomaly. BEA Ohio employment data show jobs in broadcasting and telecommunications (NAICS 515 and 517) *decreasing over the decade almost without interruption* from 9,888 to 7,730 and from 36,545 to 28,726, respectively (U.S. BEA, 2019).

18 The BEA imputes the rental value of owner-occupied housing, treating homeowners as businesses paying rent to themselves. Therefore, homeowners contribute to the real estate industry's GDP even if not employed by the industry. In addition, like businesses, homeowners' property taxes paid to state and local governments are included as part of taxes on production and imports for the real estate industry (U.S. BEA, 2019).

19 The presence of Federal Reserve Bank (5211) offices in Cleveland and Cincinnati guarantees the concentration of monetary authority and central banking here, although the small employment numbers – when compared to credit intermediation (522) – suggest a minor role in sector concentration (U.S. Bureau of the Census, 2018b).

20 Managing offices differ from holding companies. The latter hold an equity interest to control or influence company management, but do not manage specific company establishments (Office of Management and Budget, 2007).

21 Full-time equivalent (FTE) employment with Ohio state and local governments was estimated to be 587,547 in 2012 according to the latest Census of Governments. Of that number, 42.3 percent worked for independent local school districts, 23.1 percent worked for the state, 14.4 percent worked for counties, 13.8 percent worked for municipalities, 3.6 percent worked in special districts, and 2.8 percent worked for townships. If the 71,276 FTE state-level education employees are added to the 248,486 FTE independent school district employees, then an estimated 54.4 percent of all state and local government employment in Ohio is part of education. (Some county and municipality data are missing, but the problem is not large enough to substantially change the conclusion.) Most of the remaining FTE employees worked in hospitals and other health establishments, law and public safety (corrections, judicial, legal, police and firefighters), public welfare/social insurance, transportation-related services, various utilities, and general administration (U.S. Bureau of the Census, 2014a). Private sector provision of the same or similar services are classified in NAICS codes 22 (utilities), 48 (transportation), 56 (administrative support/waste management and remediation), 61 (education) and 62 (health care and social assistance).

22 The motor vehicle industry also is concentrated in Indiana and Michigan. However, Arizona, Florida and Nevada are more dependent on the tourism-related leisure and hospitality sectors; they also were hit hard when the housing bubble burst and local construction activity fell (U.S. BEA, 2019).

23 On the other hand, recall data in Appendix Table A3 show Ohio's motor vehicle industry (NAICS 3361-3363) grew to a post-recession peak in 2014, but gradually contracted through 2017. This is partially due to light vehicle assemblies (33611) falling 27.1 percent in Ohio from 2015 to 2017, with declines in car and light truck output in approximately the same proportions. The reasons behind these changes are quite different: car assemblies declined as national preferences shifted from cars to light vehicles; light truck assemblies (of sport-utility vehicles and vans) declined mostly because Fiat-Chrysler moved Cherokee production out of state, temporarily closing its Toledo North plant for retooling. Its adjacent Supplier Park plant (fka Toledo South or Stickney) was temporarily shut down in 2018 as Wrangler assemblies shifted to a now re-opened Toledo North, and preparations were made for new pickup assemblies at Supplier Park. The net effect of these and other changes at other plants is 2018 light vehicle assemblies in Ohio declined 0.8 percent from 2017 (Automotive News, 2016-2019).

24 The chart covers at least 94 percent of each economy at the most detailed levels available from the BEA. The exceptions not shown are outliers where growth was extreme and/or differences in magnitude were striking:

	In Ohio	In the U.S.
211: Oil and gas extraction	1,309.9%	78.6%
213: Support activities for mining	505.6%	150.2%
334: Computer and electronic products manufacturing	477.3%	949.9%
486: Pipeline transportation	1,078.9%	243.7%
518-9: Data processing, hosting and other information services	259.1%	792.2%

These contrasts are remarkable and indicate the largest structural changes in the respective economies, but the collective contribution of the eight was at most six percent of each economy (U.S. BEA, 2019).

25 Moody's (2018) also notes the high degree of similarity between economic changes in Ohio and the U.S.

26 Economic forecasts, though, are often imprecise due to any number of factors. Among them are the impacts of technological advances and unforeseeable events, limited data, an incomplete understanding of the economy, and assumptions about the economy that may not be entirely justified. This imprecision also means that recessions are difficult to predict.

27 Other factors to consider are variations in capacity utilization rates – particularly important in goods-producing sectors – and the number of hours worked. Both affect output even if the number of employees does not change.

28 Projections and forecasts are based on explicit and implicit assumptions that may or may not be justified. Further-

more, variations in expansion and contraction cycles and unforeseen developments can impact growth rates – and the last may vary in their impact between the national and local levels. Consequently, it is advisable to think of projections and forecasts as contingent possibilities extrapolated from the recent past and not as precise certainties.

29 The number of building permit issued in Ohio also grew from 2017 to 2018, but at a slower rate than in previous years coming out of the recession (U.S. Bureau of the Census, n.d.) Perhaps in recognition of Ohio's similarity with the national economy, ODJFS/LMI also incorporates the latest Conference Board (2019) prediction: continued expansion of the American economy at an inflation-adjusted 2.0 percent annual rate into 2020, generally lower than rates of recent quarters. In the context of absolute numbers and Ohio's slower population growth rate, Moody's (2018) predictions do not seem unreasonable.

30 The use of tariffs assumes unchanging values of currencies relative to one another. This is often unjustified. The recent weakening of the yuan relative to the dollar, which counters the effect of tariffs on the prices of Chinese goods in the U.S. market, led to a demand that the Federal Reserve lower interest rates to make the dollar less appealing in currency exchanges and therefore less valuable. However, there are two problems with that reasoning: 1) lowering the interest rate could boost the U.S. economy, which would support the dollar's value, and 2) escalating trade tensions have supported the dollar's value as investors seek the safest assets – U.S. Treasury bills (drawn from Greifeld and Bull, 2019; and Worrachate, 2019).

SOURCES AND REFERENCES CITED

Appelbaum, Binyamin, 2011
"On Economy, Raw Data Gets a Grain of Salt," New York Times, August 16. Found at http://www.nytimes.com/.

Association of American Railroads, 2017
See https://www.aar.org/.

Automotive News, 2016-2020
Various reports found at http://www.autonews.com/datacenter.

Board of Governors of the Federal Reserve System, 2020
See https://www.federalreserve.gov/releases/g17/current/ for current and earlier industrial production index values.

Bradshaw, Keith, and Cao Li, 2018
"China threatens new tariffs on $60 billion of U.S. goods," August 3, New York Times.

Choe, Stan, and Alex Veiga, 2019
"Tumult on Wall Street expected to continue," Columbus Dispatch, August 17, pp. C1 & C5.

Conference Board, 2019
See https://www.conference-board.org/data/bcicountry.cfm?cid=1 for the latest leading indicators report.

Dendrinou, Viktoria, and Alexander Weber, 2018
"EU Prepares to Retaliate Over Car Tariffs Before Trump Talks," July 19, Bloomberg, found at
https://www.bloomberg.com/news/articles/2018-07-19/eu-is-said-to-prepare-car-tariff-retaliation-before-trump-talks.

ELM Analytics, Inc., 2018
Data found at http://www.elmanalytics.com/.

Fortune, 2019
Start with http://www.fortune.com/. Look for the Fortune U.S.-1,000 and Global-500 lists.

Greifeld, Katherine, and Alister Bull, 2019
"Trump lobbies for a weaker dollar," Columbus Dispatch, August 9, p. B10.

Irwin, Neil, 2018
"The Three Most Likely Recession Starters," New York Times, August 5, p. BU4.

_____, 2019
"Trade war not alone in causing turbulence," Columbus Dispatch, August 15, pp. B9 & B12.

Lenze, David G., 2016
"Regional Quarterly Report: State Personal Income and More…," found at http://0716_state_personal_income.pdf.

Livingston, Doug, 2019
"Amazon adding 2,500 more jobs in Ohio," Columbus Dispatch, July 23, pp. B9 & B12.

Malone, J.D., 2018
"Growing concern: Farmers' confidence slumps on trade worries, low commodity prices," Columbus Dispatch, August 8, pp. B9 & B12.

Marte, Jonnelle, 2019
"Most economists expect recession by 2021," Columbus Dispatch, August 20, pp. B9 & B12.

McDonald, Joe, 2019
"Chinese retaliation to more tariffs likely," Columbus Dispatch, August 16, p. B12.

Moody's, 2018
Moody's Analytics / Précis U.S. State / Midwest / June. Found at http://www.economy.com/.

Nebehay, Stephanie, 2018
"U.S. tariff study raises concerns from 40 countries at WTO meeting," July 5, Automotive News, article found at http://www.autonews.com/article/20180705/COPY01/307059957/u.s.-tariff-study-raises-concerns-from-40-countries-at-wto-meeting.

ODJFS/LMI (Ohio Dept. of Job and Family Services/Labor Market Information), 2018
See http://ohiolmi.com/, and check “Data” and then “Employment Projections by Occupation and Industry.”

_____, 2019
See http://ohiolmi.com/proj/Indicators/LI.pdf for the latest monthly issue on leading indicators.

ODNR (Ohio Dept. of Natural Resources), 2019
Start with http://oilandgas.ohiodnr.gov/, look under industry for well production, then combined production.

OECD (Organization for Economic Cooperation and Development), 2019
Start with http://www.oecd.org/ and search on “PPP” for a discussion of purchasing power parities.

Office of Management and Budget, 1998 and 2007
North American Industry Classification System: United States, 1997 and 2007. Lanham, Md.: Bernan Press. Also see http://www.census.gov/eos/www/naics/ for the 2012 NAICS.

Office of Research, 2018
See https://www.development.ohio.gov/reports/reports_pop_proj_map.htm.

Ott, Thomas, 2013
“Ohio wraps up first year of casino gambling; payoff still taking shape,” the Cleveland Plain Dealer, May 12. Article found at http://www.cleveland.com/metro/index.ssf/2013/05/ohio_wraps_up_first_year_of_ca.html.

Platt, Joel D., and Ian Mead, 2017
Gross Domestic Product by State Estimation Methodology. Paper found at https://www.bea.gov/sites/default/files/methodologies/0417_GDP_by_State_Methodology.pdf

Rugaber, Christopher et al., 2019
“Slowing, not stopping,” Columbus Dispatch, August 16, pp. B9 & B12.

Sutherly, Ben, 2013
“Average nursing-home patient getting younger,” the Columbus Dispatch, August 2, pp. A1 & A9.

Swanson, Ana, and Alan Rappeport, 2020
"US, China ink trade deal," the Columbus Dispatch, January 16, pp. A1 & A4.

Telford, Taylor, 2019
"Tariffs on China to cost US families $1,000," Columbus Dispatch, August 21, p. B10.

Torry, Jack, 2018
"Trump tariffs aren't likely to help steel," the Columbus Dispatch, July 4, pp. A1 & A6-A7.

U.S. Bureau of the Census, 2014a
2012 Census of Governments found at http://www.census.gov/govs/apes/historical_data_2012.html.

_____, 2014b
The original website was http://www.census.gov/population/projections/data/national/2014/summarytables.html for national population projections.

_____, 2018
2016 Annual Survey of Manufactures [machine-readable data file] / prepared by the Bureau. Washington, D.C.: the Bureau [producer and distributor].

_____, 2019a
2017 American Community Survey data from tables C23001 and C24080 originally found at http://factfinder.census.gov/.

_____, 2019b
Cbp17st.txt and cbp17us.txt [machine-readable state and national County Business Patterns data files for 2017] / prepared by the Bureau. Washington, D.C.: the Bureau [producer and distributor].

_____, n.d.
Building permit data disseminated in various formats over the years.

U.S. BEA (Bureau of Economic Analysis), 2019
See http://www.bea.gov/ and look for state GDP, employment and population figures first under "topic" and then "interactive data."

U.S. BLS (Bureau of Labor Statistics), 2018
See http://www.bls.gov/emp/ep_table_207.htm.

U.S. CIA (Central Intelligence Agency), 2019
See https://www.cia.gov/ and start with the “World Factbook.”

U.S. DA (Dept. of Agriculture), 2019
Search for the Crop Production 2017 Summary at http://www.nass.usda.gov/.

U.S. EIA (Energy Information Administration), 2019
Start at http://www.eia.gov/ search for the coal production and reserve statistics.

U.S. FPDS (Federal Procurement Data System), 2019
See https://www.fpds.gov/; code=9700 for the Dept. of Defense contracts. New user must establish an account before extracting data.

U.S. Geological Survey, 2019
See http://minerals.usgs.gov/minerals/pubs/commodity/iron_&_steel/index.html#mc5.

Wikipedia, 2019
“Wilmington Air Park,” found at https://en.wikipedia.org/wiki/Wilmington_Air_Park.

Worrachate, Anchalee, 2019
“Trump keeps accidentally igniting dollar with his trade war,” Columbus Dispatch, August 9, p. P4.